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Annual List of Periodicals

U.S. ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

Publication of an abstract, annotation, or citation does not imply endorsement by the Environmental Protection Agency of the original article or of commercial materials, equipment, or processes mentioned therein.

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Preface

Included in this issue is a list of sources from which at least one article was abstracted for publication in either Volume 9 (1976) or Volume 10 (1977); however, more than 2500 primary serials and secondary sources, books, and non-periodical publications are screened. Journal titles are abbreviated according to the format of the *Bibliographic Guide for Editors and Authors*, available from Chemical Abstracts Service. Japanese publications are listed by the Hepburn romanization of the complete title which is followed by the abbreviated English equivalent in parentheses. For additional convenience, English titles of Japanese periodicals are listed separately and cross-referenced.

ACS SYMP SER
ACTA ALIMENT
ACTA ANAT
ACTA BIOCHIM BIOPHYS ACAD SCI HUNG
ACTA BIOL ACAD SCI HUNG
ACTA BIOL MED GER
ACTA CIENT COMPOSTELANA
ACTA HEPATO-GASTROENTEROL
ACTA HISTOCHEM
ACTA HYDROCHIM HYDROBIOL
ACTA MED IRAN
ACTA MED SCAND
ACTA MICROBIOL POL
ACTA NEUROPATHOL
ACTA OBSTET GYNAECOL JPN
ACTA PAEDIATR SCAND
ACTA PHARM HUNG
ACTA PHARM JUGOSL
ACTA PHARMACOL TOXICOL
ACTA PHYSIOL LAT AMER
ACTA PHYSIOL POL
ACTA PHYSIOL SCAND
ACTA POL PHARM
ACTA VET (BRNO)
ACTA VET SCAND
ADSORBTSIYA ADSORBENTY
ADV ENZYME REGUL
ADV EXP MED BIOL
ADV INSECT PHYSIOL
ADV PHARMACOL CHEMOTHER
AFINIDAD
AGENTS ACTIONS
AGRESSOLOGIE
AGRIC AM
AGRIC AVIAT
AGRIC BIOL CHEM (TOKYO)
AGRIC CHEM MON SEE KONGETSU NO NOYAKU
AGRIC ENG
AGRIC ENVIRON
AGRIC RES
AGRO-ECOSYSTEMS
AGROCHEMIA (PRAGUE)
AGROCHIMICA
AGROKEM TALAJTAN
AGROKHIMIYA
AGRON J
AKITA J RURAL MED
  SEE AKITA-KEN NOSON IGAKKAI ZASSHI
AKITA-KEN NOSON IGAKKAI ZASSHI
ALLG FORSTZ
AM BEE J
AM IND HYG ASSOC J
AM J CLIN NUTR
AM J DIS CHILD
AM J ENOL VITIC
AM J EPIDEMIOL
AM J OBSTET GYNECOL
AM J PATHOL
AM J PHYSIOL
AM J PUB HEALTH
AM RESP DIS
AM REV RESPIR DIS (SUPPL)
AM ZOOL
AMBIO
AN QUIM
AN R ACAD NAC MED
ANAESTHESIA
ANAL BIOCHEM
ANAL CHEM
ANAL CHIM ACTA
ANAL LETT
ANALES ASOC QUIM ARGENTINA
ANALUSIS
ANALYST (LONDON)
ANAT REC
ANESTH ANALG
ANN AGRON
ANN ALLERG
ANN APPL BIOL
ANN ARID ZONE
ANN CHIM
ANN CLIN BIOCHEM
ANN CLIN LAB SCI
ANN FALSIF EXPERT CHIM
ANN INT MED
ANN MED VET
ANN N Y ACAD SCI
ANN NUTR ALIMENT
ANN PEDIATR SEE SEM HOP
ANN TROP MED PARASITOL
ANNU REP HIROSHIMA PREF AGR
ANNU REP PUBLIC HEALTH OSAKA PREF

ANNU REP SANKYO RES LAB
SEE SANKYO KENKYUSHO NENPO
ANNU REP TOKYO METROP LAB PUBLIC HEALTH
SEE TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
ANNU REP YAMANASHI PREFECT INST PUBLIC HEALTH SEE YAMANASHI KENRITSU EISEI KENKYUSHO NENPO
ANNU REV MICROBIOL
ANNU REV PHARMACOL
ANTIOQ MED
ANTONIE VAN LEEUWENHOEK J MICROBIOL
ANZ SCHAEDLINGSKD PFLANZENSCH UMWELT
APPL ENVIRON MICROBIOL
APPL MICROBIOL
APPL SPECTROSC
ARCH ANAT MICROS MORPHOL EXP
ARCH BELG MED SOC HYG MED TRAV
ARCH BIOCHEM BIOPHYS
ARCH DERMATOL
ARCH DERMATOL RES
ARCH DIS MAL PROF
ARCH ENVIRON CONTAM TOXICOL
ARCH ENVIRON HEALTH
ARCH EXP VETERINAERMED
ARCH FISCHEREIWISS
ARCH GESCHWULSTFORSCH
ARCH IND HYG TOXICOL
ARCH INT PHYSIOL BIOCHIM
ARCH MAL PROF MED TRAV SECUR SOC
ARCH MIKROBIOL
ARCH PHYS MED REHABIL
ARCH TOXIKOL
ARCH VET
ARH HIG RADA TOKSIKOL
ARKANSAS FARM RES
ARQ INST BIOL (SAO PAULO)
ARZNEIM-FORSCH
ATMOS ENVIRON
ATTI SOC ITAL SCI VET
AUST J EXP AGRIC ANIM HUSB
AUST N Z J MED
AUST N Z J OBSTET GYNAECOL
BEHAV BIOL
BEITR TABAKFORSCH
BER DTSCH BOT GES
BERUFS-DERMATOSEN
BIOCHEM BIOPHYS RES COMMUN
BIOCHEM J
BIOCHEM PHARMACOL
BIOCHEM SOC TRANS
BIOCHEMISTRY
BIOCHIM BIOPHYS ACTA
BIOINORG CHEM
BIOL BULL
BIOL CONSERV
BIOL RUNDSCH
BIOLOGIA
BIOLOGICO
BIOMED MASS SPECTRUM
BIOMEDICINE
BIOMETRICS
BIOSCIENCE
BITKI KORUMA BUL
BIUL INST MED MORSKIEJ
BIUL INST OCHR ROSL
BLOOD
BOCHU-KAGAKU SEE SCI PEST CONTROL
BODENKULTUR
BOEI EISEI
BOL OF SANIT PANAM
BOLL CHIM FARM
BOLL LAB CHIM PROV
BOLL SOC ITAL BIOL SPER
BORGYOGY VENEROL SZ
BR J ANAESTH
BR J CLIN PRACT
BR J EXP PATHOL
BR J IND MED
BR J PHARMACOL
BR MED BULL
BR MED J
BR VET J
BRATISL LEK LISTY
BROMATOL CHEM TOKSYKOL
BUDAPESTI KOZEGESZEGUGY
BULL ACAD NATL MED PARIS
BULL ACAD POL SCI
BULL ACAD VET FR
BULL AGRIC CHEM INSP STN
SEE NOYAKU KENSASHO HOKOKU
BULL ENTOMOL RES
BULL ENVIRON CONTAM TOXICOL
BULL EXP BIOL MED (USSR)
BULL GRAIN TECHNOL
BULL INST MAR TROP MED ACAD GDA
BULL KANAGAWA PREF PUBLIC HEALTH LAB
BULL MAR SCI
BULL MT DESERT ISL BIOL LAB
BULL SOC CHIM FR
BULL SOC ROY SCI LIEGE
BULL SOC ZOOL FR
BULL VET INST PULAWY
BULL WHO
BUNSEKI KAGAKU SEE JPN ANAL
BYULL EKSP BIOL MED
C R HEBD SEANCES ACAD SCI PARIS SER D
C R SEANCES ACAD AGRIC FR
C R SEANCES SOC BIOL SES FIL
CALIF AGRIC
CAN CHEM PROC
CAN ENTOMOL
CAN FIELD-NAT
CAN FOR SERV CHEM CONTR RES INS
CAN J BIOCHEM
CAN J GENET CYTOL
CAN J MICROBIOL
CAN J PHYSIOL PHARMACOL
CAN J PLANT SCI
CAN J PUBLIC HEALTH
CAN J SOIL SCI
CAN J ZOOL
CAN MED ASSOC J
CANCER (TOKYO) SEE GANN
CANCER DETECT PREVENT
CANCER LETT
CANCER RES
CASE HIST SEE KARUTE
CELL TISS RES
CESK HYG
CHEM AGE INDIA
CHEM ANAL (WARSAW)
CHEM-BIOL INTERACT
CHEM CONTR RES INST REP

CHEM ENG (LONDON)
CHEM ENG NEWS
CHEM ENG PROG
CHEM FORSCH WIRT OESTERR OESTER
CHEM IND (LONDON)
CHEM IND (TOKYO) SEE KAGAKU KOGYO
CHEM N Z
CHEM PHARM BULL
CHEM SOC REV
CHEM TECH (AMSTERDAM)
CHEM UNSERER ZEIT
CHEM WEEK
CHEM WEEKBL
CHEMICAL REGULATION OF PLANTS
CHEMISTRY
CHEMOSPHERE
CHEST
CHIBA IGAKKAI ZASSHI
CHIM IND (MILAN)
CHIMIA
CHROMATOGRAPHIA
CITRUS IND
CLIN BIOCHEM
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CLIN ELECTROENCEPHALOGR SEE RINSHO NOHA
CLIN MED
CLIN PEDIATR
CLIN PHARMACOL THER
CLIN RES
CLIN SCI MOL MED
CLIN TOXICOL
COLLECT CZECH CHEM COMMUN
COMMUNITY HEALTH (BRISTOL)
COMP BIOCHEM PHYSIOL
COMP GEN PHARMACOL
COMPOST SCI
CONGENITAL ANOMALIES SEE SENTEN IJO
CONSULTANT
CONTACT DERMATITIS
CONTRIB IST RIC AGRAR MILAN
CRIT REV ENVIRON CONTROL
CRIT REV MICROBIOL
CRIT REV TOXICOL
CURR SCI
CYTOBIOS
CYTOLOGIA
DANSK IND
DISS ABSTR INT B
DOKL AKAD BULG NAUK
DOKL AKAD NAUK AZ SSR
DOKL AKAD NAUK SSSR
DOKL TSKHA
DOKL VSES AKAD S'KH NAUK
DOPOV AKAD NAUK UKR RSR SER B
DRUG METAB DISPOS
DRUG METAB REV
DTSCH GESUNDHEITSWES
DTSCH GEWASSERKD MITT
DTSCH LEBENSM-RUNDSCH
DTSCH MED WOCHENSCHR
DTSCH TIERAERZTL WOCHENSCHR
EAU QUEBEC
ECOLOGY
EGESZSEGTUDOMANY
EGYPT J GENET CYTOL
EGYPT J MICROBIOL
EHIME KENRITSU EISEI KENKYU JOHO
EISEI KAGAKU (J HYG CHEM)
EKSP KHIR ANESTEZIOL
EKSP MED MORFOL
ELECTR LIGHT POWER
ELECTROENCEPHALOGR CLIN NEUROPHYSIOL
EMERG MED
ENDOCRINOLOGY
ENTOMOL EXP APPL
ENVIRON CONSERV
ENVIRON CREATION SEE KANKYO SOZO
ENVIRON ENTOMOL
ENVIRON EXP BOT
ENVIRON HEALTH PERSPECT
ENVIRON LETT
ENVIRON PHYSIOL BIOCHEM
ENVIRON POLLUT
ENVIRON POLLUT COUNTERMEASURES
ENVIRON RES
ENVIRON SCI TECHNOL
ENVIRONMENT
ENVIRONMENTAL HEALTH REPORT
ENZYME
ERNAEHRUNGSFORSCHUNG
ESSAYS BIOCHEM
EUR J APPL MICROBIOL
EUR J BIOCHEM
EUR J FOR PATHOL
EUR J INTENSIVE CARE MED
EUR J MED CHEM CHIM THER
EUR J NUCL MED
EUR J PHARMACOL
EUR J TOXICOL SEE J EUR TOXICOL
EUR J TOXICOL ENVIRON HYG
EVOL MED
EXP AGRIC ANIM HUSB
EXP CELL BIOL
EXP EYE RES
EXP MOL PATHOL
EXP NEUROL
EXP PARASITOL
EXP PATHOL
EXPERIENTIA
FAO PLANT PROT BULL
FARM CHEM
FARM ZH (KIEV)
FARMACO (ED PRAT)
FARMACO (ED SCI)
FARMAKOL TOKSIKOL (MOSCOW)
FARMATSIYA (MOSCOW)
FARUMASHIA (PHARMACY)
FATS AND OILS
FDA BY-LINES
FEBS LETT
FED PROC FED AM SOC EXP BIOL
FETTE SEIFEN ANSTRICHM
FINSK VETERINARTIDSKR
FIRE ENG
FISH BULL
FIZIOL AKT VESHCHESTVA
FIZIOL ZH (KIEV)
FLEISCHWIRTSCHAFT
FLUORIDE
FOLIA BIOL (PRAGUE)
FOLIA ENDOCRINOL JPN
  SEE NIPPON NAIBUMPI GAKKAI ZASSHI
FOLIA ENTOMOL MEX
FOLIA HISTOCHEM CYTOCHEM

FOLIA MED (PLOVDIV)
FOLIA MORPHOL (WARSAW)
FOLIA OPHTHALMOL JPN SEE NIPPON GANKA KIYO
FOLIA PHARMACOL JPN
  SEE NIPPON YAKURIGAKU ZASSHI
FOOD COSMET TOXICOL
FORENSIC SCI
FORTSCHR VETERINAERMED
FORUM UMWELTHYG
FRESENIUS Z ANAL CHEM
FRESHWATER BIOL
FUKUOKA ACTA MED
FUKUOKA IGAKKAI ZASSHI
G IG DERMATOL
G IG MED PREV
GANKA RINSHO IHO (JPN REV CLIN OPHTHALMOL)
GANN (CANCER)
GANN MONOGRAPH CANCER RES
GARTENBAU
GARTENBAUWISSENSCHAFT
GAS-WASSERFACH WASSER-ABWASSER
GASTROENTEROLOGY
GAZ WODA TECH SANIT
GEKKAN YAKUJI
GEN PHARMACOL
GENETICS
GENETIKA
GESUNDH-ING
GESUNDHEITSWES DESINFEKT
GIDROBIOL ZH
GIG PRIMEN TOKSIKOL PEST KLIN
GIG SANIT
GIG TR PROF ZABOL
GRADINAR LOZAR NAUKA
GRASAS ACEITES (SEVILLE)
GYOGYSZERESZET
GYOMU NEMPO KANAGAWA-KEN NOGYO
HAREFUAH
HAUTARZT
HAWAIIAN SUGAR PL ASS ANNU REP
HEALTH PHYS
HERBA POL
HEREDITAS
HIROSAKI IGAKU (HIROSAKI MED J)
HIROSAKI MED J SEE HIROSAKI IGAKU
HISTOCHEMISTRY
HOKKAIDORITSU EISEI KENKYUSHO-HO
HOPPE-SEYLERS Z PHYSIOL CHEM
HORMONE RES
HORTSCIENCE
HRANA ISHRANA
HUM HYG SEE MINZOKU EISEI
HYOGO KEN EISEI KENKYU JO KENKY
IARC MONOGRAPHS
IARC SCI PUBL
IBARAKI DAIGAKU NOGAKUBU GAKUJU
IG MOD
IG SANIT PUBBLICA
IGAKU NO AYUMI
IGAKU TO SEIBUTSUGAKU (MED BIOL)
IGIENA
IN VITRO
IND ALIMENT (PINEROLO ITALY)
IND MED SEE SANGYO IGAKU
INDIAN FOOD PACKER
INDIAN J AGRIC SCI
INDIAN J BIOCHEM BIOPHYS
INDIAN J CHEM
INDIAN J ENVIRON HEALTH
INDIAN J EXP BIOL
INDIAN J MED RES
INDIAN PEDIATR
INDIAN SCI CONGR ASSOC PROC
INDIAN SUGAR
INDIANA AGRIC EXP STN INSP REP
INFECT IMMUN
INQUINAMENTO
INT ARCH ARBEITSMED
INT BIODETERIOR BULL
INT J CANCER
INT J ENVIRON ANAL CHEM
INT J ENVIRON STUD
INT PEST CONTROL
INTERNIST
INVEST PESQ
ION (MADRID)
ISOTOPENPRAXIS
ISR J ENTOMOL
ISR J MED SCI
IWATE-KEN EISEI KENKYUJHO HOKOKU
IZV AKAD NAUK AZ SSR SER BIOL
IZV AKAD NAUK SSSR SER BIOL
IZV AKAD NAUK SSSR SER KHIM
IZV AKAD NAUK TURKM SSR
IZV TIMIRYAZEV S'KH AKAD
J AGRIC CHEM SOC JPN
  SEE NIPPON NOGEI KAGAKU KAISHI
J AGRIC FOOD CHEM
J AGRIC SCI
J AGRIC SCI (TOKYO)
  SEE NOGYO GIJUTSU (TOKYO)
J AGRIC UNIV P R
J AIR POLLUT CONTROL ASSOC
J ALA ACAD SCI
J AM ANIM HOSP ASSOC
J AM MED ASSOC
J AM OIL CHEM SOC
J AM PHARM ASSOC
J AM SOC HORTIC SCI
J AM VET MED ASSOC
J AM WATER WORKS ASSOC
J ANAL TOXICOL
J ANIM SCI
J ANTIBIOT
J APPL BACTERIOL
J APPL ECOL
J ARGENT TOXICOL ANAL ACTAS
J ASSOC OFF ANAL CHEM
J AUST ENTOMOL SOC
J BACTERIOL
J BIOCHEM (TOKYO)
J BIOL CHEM
J CELL BIOL
J CELL SCI
J CHEM INFORM COMPUT SCI
J CHEM SOC PERKIN TRANS II
J CHROMATOGR
J CHROMATOGR BIOMED APPL
J CHROMATOGR SCI
J CLIN ENDOCRINOL METAB
J CLIN MED
J DAIRY RES
J DAIRY SCI
J DRUG RES EGYPT

J ECON ENTOMOL
J EGYPT MED ASSOC
J ELECTROCHEM SOC
J ELISHA MITCHELL SCI SOC
J ENVIRON ECON MANAGE
J ENVIRON HEALTH
J ENVIRON PATHOL TOXICOL
J ENVIRON QUAL
J ENVIRON SCI
J ENVIRON SCI HEALTH
J EUR TOXICOL
J EXP BOT
J FERMENT TECHNOL
J FISH RES BOARD CAN
J FLA MED ASSOC
J FLOUR ANIM FEED MILLING
J FOOD HYG SOC JPN
SEE SHOKUHIN EISEIGAKU ZASSHI
J FOOD PROT
J FOOD SCI
J FOOD SCI TECHNOL (MYSORE)
J FORENSIC SCI SOC
J GEN MICROBIOL
J HAZARD MATER
J HERED
J HISTOCHEM CYTOCHEM
J HYDROLOGY
J HYG CHEM SEE EISEI KAGAKU
J INDIAN ACAD FORENSIC SCI
J INDIAN CHEM SOC
J INDIAN SOC SOIL SCI
J INORG NUCL CHEM
J INST CHEM (INDIA)
J INST ENG (INDIA)
J INST WATER ENG SCI
J INVERTEBR PATHOL
J INVEST DERMATOL
J IOWA MED SOC
J JPN ASSOC RURAL MED
SEE NIPPON NOSON IGAKKAI ZASSHI
J JPN OPHTHALMOL SOC
SEE NIPPON GANKA GAKKAI ZASSHI
J KURUME MED ASSOC
SEE KURUME IGAKKAI ZASSHI
J LABELLED COMPD RADIOPHARM
J LABELLED COMPOUNDS
J LUMINESCENCE
J MAR RES
J MED
J MED CHEM
J MED ENTOMOL
J MED SOC TOHO UNIV
SEE TOHO IGAKKAI ZASSHI
J MILK FOOD TECHNOL
J MISS STATE MED ASSOC
J N ENGL WATER WORKS ASSOC
J NAGOYA CITY UNIV MED ASSOC
SEE NAGOYA-SHIRITSU DAIGAKU IGAKKAI ZASSHI
J NATL CANCER INST
J NEUROCHEM
J NEUROL SCI
J NEUROPATHOL EXP NEUROL
J NUTR
J NUTR SCI VITAMINOL
J OCCUP MED
J PAKISTAN MED ASSOC
J PATHOL
J PEDIATR
J PEDIATR PRACT SEE SHONIKA SHINRYO
J PESTIC SCI
J PHARM BELG
J PHARM PHARMACOL
J PHARM SCI
J PHARMACOL
J PHARMACOL EXP THER
J PHOTOCHEM
J PHYSIOL (LONDON)
J PRAKT CHEM
J RADIOANAL CHEM
J RANGE MANAGE
J REPROD FERTIL
J RES PUNJAB AGRIC UNIV
J RETICULOENDOTHELIAL SOC
J SCI FOOD AGRIC
J SCI IND RES
J SCI SOIL ANIM FERT JPN
SEE NIPPON DOJO HIRYOGAKU ZASSHI
J SOC OCCUP MED
J SOIL WATER CONSERV
J STORED PROD RES
J TOXICOL ENVIRON HEALTH
J TROP MED HYG
J WATER POLLUT CONTROL FED
J WILDL MANAGE
J ZOO ANIM MED
JIKKEN DOBUTSU %EXP ANIM<
JPN AGRIC RES Q SEE JARQ
JPN ANAL SEE BUNSEKI KAGAKU
JPN J APPL ENTOMOL ZOOL
SEE NIPPON OYO DOBUTSU KONCHU GAKKAI-SHI
JPN J CLIN MED SEE NIPPON RINSHO
JPN J CLIN OPHTHALMOL SEE RINSHO GANKA
JPN J HYG SEE NIPPON EISEIGAKU ZASSHI
JPN J IND HEALTH SEE SANGYO IGAKU
JPN J LEG MED SEE NIPPON HOIGAKU ZASSHI
JPN J OPHTHALMOL SOC
SEE NIPPON GANKA GAKKAI ZASSHI
JPN J PHARMACOL
SEE NIPPON YAKURIGAKU ZASSHI
JPN J PUBLIC HEALTH
SEE NIPPON KOSHU EISEI ZASSHI
JPN MED J SEE NIPPON IJI SHINPO
JPN PESTIC INF
JPN PLANT PROTECT SEE SHOKUBUTSU BOEKI
JPN PROC ANNU MEET ASSOC IND HYG
JPN PROC ANNU MEET FOOD HYG SOC
JPN REPT PUB NUIS-DATA ENVIRON
JPN REV CLIN OPHTHALMOL
SEE GANKA RINSHO IHO
JUGOSL INOSTR DOK ZAST RADU
KAGAKU KOGYO
KAGAKU TO SEIBUTSU
KANAGAWA IGAKUKAI ZASSHI
KANAGAWA PREF GEN AGR INST REP
KANAGAWA-KEN EISEI KENKYUSHU KENKY HOKAKU
KANKYO HAKUSHO
KANKYO HOKEN
KEIO IGAKU
KEM KOZL
KEM TIDSKR
KEMIA-KEMI
KERTESZETIEGY KOZL
KHIG ZDRAVEOPAZ

KHIM SEL'SK KHOZ
KISERL ORVOSTUD
KLIN WOCHENSCHR
KOGAI TO TAISAKU
KONGETSU NO NOYAKU (AGRIC CHEM MON)
KONSERVN OVOSHCHESUSH PROM
KOSHU EISEI
KUMAMOTO MED J
KUN CHUNG HSUEH PAO
KURUME IGAKKAI ZASSHI (J KURUME MED ASSOC)
KVASNY PRUM
KYOTO-SHI EISEI KENKYUSHO NENPO
LA AGRIC
LAB ANIM
LAB ANIM SCI
LAB DELO
LAB INVEST
LAB PRACT
LAEKARTIDNINGEN
LAIT
LANCET
LANDBAUFORSCH VOELKENRODE
LANDWIRTSCH FORSCH
LATTE
LIET TSR MOKSLU AKAD DARB SER C
LIFE SCI
LIMOSA
LUFTHYG SILIKOSEFORSCH
MADRAS AGRIC J
MAGY ALLATORV LAPJA
MAGYAR ONKOL
MANITOBA ENT
MANUF CONFECT
MAR BIOL
MAR FISH REV
MAR POLLUT BULL
MARINE CHEM
MATER MED POLONICA
MATER ORG
MD STATE MED J
MED BIOL SEE IGAKU TO SEIBUTSUGAKU
MED DOSW MIKROBIOL
MED J AUST
MED J MALAYSIA
MED KLIN (MUNICH)
MED LAV
MED LEG J
MED PARAZITOL PARAZIT BOLEZNI
MED PEDIATR ONCOL
MED PR
MED SEGUR TRABAJO
MED TRIAL TECH Q
MED WELT
MED WETER
MED WORLD NEWS
MED ZH UZB
MEDED FAC LANDBOUWWET RIJKSUNIV GENT
MEDICAMENTA
MEDICINA (BUENOS AIRES)
MFG CHEM AEROSOL NEWS
MICROB ECOL
MIE DAIGAKU KANKYO KAGAKU KENK
MIE IGAKU (MIE MED SCI)
MIKROBIOLOGIYA (MOSCOW)
MIKROCHIM ACTA
MILCHWISSENSCHAFT
MINERVA MED
MINERVA PEDIATR
MINN MED
MISS AGRIC FOREST EXP STN
MITT CHEM FORSCH INST WIRTSCH
MITT GEB LEBENSMITTELUNTERS HYG
MIZU SHORI GIJUTSU
MLJEKARSTVO
MOD VET PRACT
MOL CELL BIOCHEM
MOL GEN GENET
MOL PHARMACOL
MONATSH VETERINAERMED
MONATSSCHR KINDERHEILK
MONBUSHO ITAKUKENKYU HOKOKU
MONTHLY REPORT OF INVESTIGATION
MOSQ NEWS
MUNKAVEDELEM
MUTAT RES
MYSORE J AGRIC SCI
N J AGRIC EXP STN BULL
N Y FOOD LIFE SCI BULL
N Z J AGRIC
N Z J AGRIC RES
N Z J EXP AGRIC
N Z J SCI
N Z MED J
NACHRICHTENBL DTSCH PFLANZENSCHUTZDIENSTES
(BRAUNSCHWEIG)
NACHRICHTENBL PFLANZENSCHUTZDIENST DDR
NAGASAKI-KEN EISEI KOGAI KENKYUSHO
NAGOYA-SHIRITSU DAIGAKU IGAKKAI ZASSHI
NAHRUNG
NARA IGAKKAI ZASSHI
NAT BELG
NATL DEF MED J SEE BOEI EISEI
NATURE (LONDON)
NATURFORSCHUNG
NATURWISS RUNDSCH
NATURWISSENSCHAFTEN
NAUNYN-SCHMIEDEBERGS ARCH PHARMAKOL
NED TIJDSCHR GENEESKD
NEDER MIL GENEESKD TIJDSCHR
NEOPLASMA
NETH J MED
NEUROLOGICAL MEDICINE
NEUROLOGY
NEUROPATOL POL
NEUROSCIENCE
NEW PHYTOL
NEW SCI
NIPPON DOJO-HIRYOGAKU ZASSHI
(J SCI SOIL ANIM FERT JPN)
NIPPON EISEIGAKU ZASSHI (JPN J HYG)
NIPPON GANGAKKAI KIJI
(PROC JPN CANCER ASSOC)
NIPPON GANKA GAKKAI ZASSHI
(J JPN OPHTHALMOL SOC)
NIPPON GANKA KIYO (J JPN OPHTHALMOL)
NIPPON HOIGAKU ZASSHI (JPN J LEG MED)
NIPPON IJI SHINPO (JPN MED J)
NIPPON KOGYO EISEI GAKKAI NENKA
NIPPON KOSHU EISEI ZASSHI
(JPN J PUBLIC HEALTH)
NIPPON KYOBU SHIKKANGAKKAI ZASS
NIPPON NOGEI KAGAKU KAISHI
(J AGRIC CHEM SOC JPN)

NIPPON NOSON IGAKKAI ZASSHI
(J JPN ASSOC RURAL MED)
NIPPON OYO DOBUTSU KONCHU GAKKAI-SHI
(JPN J APPL ENTOMOL ZOOL)
NIPPON SUISAN GAKKAISHI
NIPPON YAKURIGAKU ZASSHI (JPN J PHARMACOL)
NOGYO OYOBI ENGEI
NORD VET MED
NOUV PRESSE MED
NOYAKU
NOYAKU BENRAN (TOKYO)
NOYAKU BIJINESU
NOYAKU KENKYO
NOYAKU KENSASHO HOKOKU
SEE BULL AGRIC CHEM INSP STN
NURS MIRROR
NURS TIMES
NUTR REV
OCCUP HEALTH NURSING
OCEANS
OCEANUS
OFTALMOL ZH
OHIO REPORT
OIKOS
OKAYAMA IGAKKAI ZASSHI (J OKAYAMA MED SOC)
OKAYAMA-KEN EISEI KENKYUSHO NENPO
(ANNU REP OKAYAMA PREFECT PUBLIC HEALTH LAB)
OKHR PRIR MOLD
ONCOLOGY
ORV HETIL
OUEST MED
OYO-YAKURI (PHARMACOMETRICS)
PAEDIATRICIAN
PAK J SCI IND RES
PANS (PESTIC ARTIC NEWS SUMM)
PAP PUU
PARASITICA
PATIENT CARE
PATOL POL
PEDIATR AKUSH GINEKOL
PEDIATR ANN
PEDIATR JPN
PEDIATR RES
PEDIATRICS
PEDIATRIYA (MOSCOW)
PEDOBIOLOGIA
PERIOD POLYTECH CHEM ENG
PEST CONTROL
PESTIC BIOCHEM PHYSIOL
PESTIC MONIT J
PESTIC SCI
PESTIC TECH SEE NOYAKU SEISAN GIJUTSU
PESTICIDES
PESTICIDES (TOKYO) SEE NOYAKU
PFLANZENARZT
PFLANZENSCHUTZ-NACHR (AM ED)
PHARM PRAX
PHARM WEEKBL
PHARMACOL RES COMMUN
PHARMACOL THER A
PHARMACOLOGIST
PHARMACOLOGY
PHARMACOMETRICS SEE OYO YAKURI
PHARMACY SEE FARMUASHIA
PHARMAZIE
PHILIPS TECH REV
PHYCOLOGIA
PHYSIOL PLANT
PHYSIOLOGIST
PHYTOCHEMISTRY
PHYTOMA
PHYTOPARASITICA
PHYTOPATHOLOGY
PLANT DIS REP
PLANT PHYSIOL
PLANT PROTECT SEE SHOKUBUTSU BOEKI
PLANT SOIL
POL J PHARMACOL PHARM
POL J SOIL SCI
POL TYG LEK
POLLUT ATMOS
POSTEPY NAUK ROLN
POSTGRAD MED J
POULT SCI
PR INST LAB BADAW PRZEM SPOZYw
PR L ANN MEET JPN ASS IND HLTH
PR VULHM
PRAC LEK
PRACTITIONER
PRESSE MED
PREV MED
PRIRODA (SOFIA)
PROBL ENDOKRINOL
PROBL GEMATOL PERELIV KROVI
PROC AM ASSOC CANCER RES
PROC ANNU MEET AM WOOD PRES ASS
PROC ANNU MEET FOOD HYG SOC JPN
PROC EUR SOC TOXICOL
PROC INDIANA ACAD SCI
PROC JPN CANCER ASSOC
PROC KANSAI PLANT PROTECT SOC
SEE KANSAI BYOCHUGAI KENKUKAI-HO
PROC KANTO TOSAN PLANT PROTECT SOC
SEE KANTO TOSAN BYOGAICHU KENKYUKAI NENPO
PROC N CENT BR ENTOMOL SOC AM
PROC NATL ACAD SCI USA
PROC NUTR SOC
PROC PA ACAD SCI
PROC R SOC MED
PROC S D ACAD SCI
PROC S WEED SCI SOC
PROC SOC ANAL CHEM
PROC SOC EXP BIOL MED
PROC SYMP PESTIC SCI
PROC WEST SOC WEED SCI
PROCESS BIOCHEM
PROG EXP TUMOR RES
PROGR AGRIC ARIZONA
PROGR CHEM CHEM IND
SEE HWAHAK KWA KONGOP UI CHINBO
PRUM POTRAVIN
PRZEGL LEK
PRZEM CHEM
PRZEM SPOZYW
PSYCHOPHARMACOLOGY
PSZCZELNICZE ZESZ NAUK
PUBLIC HEALTH ENVIRON SCI
PUBLIC HEALTH INFORM SEE KOSHU EISEI JOHO
PUBLIC WORKS
PURE APPL CHEM
PYRETHRUM POST
Q J MED
QUAD MERCEOL

QUAL PLANT PLANT FOODS HUM NUTR
RADIAT RES
RADIOCHEM RADIOANAL LETT
RAIL INT
RASS CHIM
REAKTS SPOSOBNOST ORG SOEDIN
RECHERCHE
REP ENVIRON SCI MIE UNIV
REP HOKKAIDO INST PUBLIC HEALTH
  SEE HOKKAIDORITSU EISEI KENKYU SHOHO
REP TOKYO PUBLIC HEALTH STUD
  SEE TOKYO-TO EISEI-KYOKU GAKKAI-SHI
REPORT INST BIOL ACTIV CHIBA
RES COMMUN CHEM PATHOL PHARMACOL
RES IND
RES VET SCI
RESIDUE REV
REV AGRIC
REV AGROQUIM TECNOL ALIMENT
REV BRAS CLIN TER
REV CAN BIOL
REV CHIM (BUCHAREST)
REV CUBANA FARM
REV ELECTROENCEPHALOGR NEUROPHYSIOL CLIN
REV FARM BIOQUIM UNIV SAO PAULO
REV INT OCEANOGR MED
REV MED-CHIR
REV MED VET (TOULOUSE)
REV ROUM CHIM
REV SANID HIG PUBLICA
REV SOC QUIM MEX
REV VET VENEZ
RICE J
RINGYO TO YAKUZAI
RINSHO EIYO
RINSHO GANKA (JPN J CLIN OPHTHALMOL)
RINSHO NOHA (CLIN ELECTROENCEPHALOGR)
RINSHO SHINKEIGAKU (CLIN NEUROL)
RINSHO TO KENKYU
RIV CLIN TOSSICOL
RIV ITAL SOSTANZE GRASSE
ROCZ AKAD ROLN POZNANIU
ROCZ INST PRZEM MLECZ
ROCZN PANSTW ZAKL HIG
RODO EISEI (JPN J IND HYG)
RODO KAGAKU
S AFR MED J
SAKH PROMST
SAKHARNAIA SVEKLA
SALUD PUB MEX
SANGYO IGAKU (IND MED)
SB RAB LENINGR VET INST
SCAND J HAEMATOL
SCAND J WORK ENVIRON HEALTH
SCHRIFTENR NEUROL NEUROL SER
SCHRIFTENR VER WASSER- BODEN- LUFTHYG
  BERLIN-DAHLEM
SCHWEIZ MED WOCHENSCHR
SCHWEIZ RUNDSCH MED (PRAXIS)
SCI FOODS SEE SHOKURYO NO KAGAKU
SCI NEWS
SCI PEST CONTROL SEE BOCHU KAGAKU
SCI TOTAL ENVIRON
SCIENCE
SCIENCE (TOKYO) SEE KAGAKU (TOKYO)
SCIENCE & INDUSTRY
SCIENCE TOOLS
SCR MED FAC MED UNIV BRUN PURKYNIANAE
SEARCH
SECURITAS
SEM HOP
SEM HOP (PARIS)
SENDAI MUN LAB HYG OFF REPT
SENTEN IJO (CONGENITAL ANOMALIES)
SHIKOKU KOSHU EISEI GAKKAI ZASSHI
SHIMANE-KEN EISEI KOGAI KENKY
SHINKEI KENKYU NO SHIMPO
SHINKEI NAIKA
SHOKUBUTSU BOEKI (PLANT PROTECT)
SHOKUBUTSU BOEKI SOKUHO
SHOKUBUTSU NO KAGAKU CHOSETSU
SHOKUHIN EISEIGAKU ZASSHI
  (J FOOD HYG SOC JPN)
SHONIKA
SHONIKA SHINRYO (J PEDIATR PRACT)
SITZUNGSBER AKAD WISS DDR
SOAP COSMET CHEM SPEC
SOGO RINSHO (CLIN ALL-AROUND)
SOIL BIOCHEM
SOIL BIOL BIOCHEM
SOIL SCI
SOIL SCI PLANT NUTR (TOKYO)
SOIL SCI SOC AM PROC
SOOBSHCH AKAD NAUK GRUZ SSR
SOUTH MED J
SOUTHEAST ASIAN J TROP MED
SOUTHWEST VET
SOV MED
SOV SOIL SCI
SPECTROSC LETT
STAERKE
STRAHLENTHERAPIE
STUD EFFECTS PESTIC LIVING BODY
SUCR BELGE
SUD-MED EKSPERT
SULZER TECH REV
SWED J AGRIC RES
TABAK (MOSCOW)
TAGUNGSBER AKAD LANDWIRTSCHAFT
TAIWAN I HSUEH HUI TSA CHIH
  SEE J FORMOSAN MED ASSOC
TAIWAN SUGAR
TEC MOLITORIA
TECH SCI MUNIC
TECHNOL REV
TER ARKH
TERATOLOGY
TETRAHEDRON LETT
TEX J SCI
TEX REP BIOL MED
THERAPIE
THROMB DIATH HAEMORRH SUPPL
TIDSSKR NOR LAEGEFOREN
TIERAERZTL UMSCH
TIJDSCHR DIERGENEESKD
TOB INT SEE TOB SCI
TOB SCI
TOHO IGAKKAI ZASSHI (J MED SOC TOHO UNIV)
TOHOKU J EXP MED
TOKYO-TORITSU EISEI KENKYUSHO KENKYU NENPO
  (ANNU REP TOKYO METROP RES LAB PUBLIC
  HEALTH)
TOXICOL APPL PHARMACOL
TOXICOLOGY

TOXICOLOGY LETTERS
TOXICON
TR STAVROP SKH INST
TR UZB NAUCHNO ISSLED INST VET
TR VSES NAUCH-ISSLED INST VET
TRANS AM FISH SOC
TRANS ASAE (AM SOC AGRIC ENG)
TRANS ILL STATE ACAD SCI REP
TRANS KANS ACAD SCI
TRANS SOC PATHOL JPN
  SEE NIPPON BYORI GAKKAI KAISHI
TRANSPLANTATION
TRAV CHIM ALIMENT HYG
TRAV SOC PHARM MONTPELLIER
TRENDS BIOCHEM SCI
TRIB CEBEDEAU
TROPENMED PARASITOL
TSITOL GENET
TSITOLOGIYA
TUMORI
TURRIALBA
UGESKR LAEG
UKR BIOKHIM ZH
UKR KHIM ZH
UROLOGY
USP SOVREM BIOL
VEST OTORINOLARINGOL
VESTN DERMATOL VENEROL
VESTN SKH NAUKI KAZ
VET CLIN NORTH AM
VET MED
VET MED NAUKI
VET MED SMALL ANIM CLIN
VET PATHOL
VET REC
VETERINARIA (SARAJEVO)
VETERINARIYA (MOSCOW)
VIRCHOWS ARCH
VOD HOSPOD B
VOEDINGSMIDDELENTECHNOLOGIE
VOENNO-MED ZH
VOJNOSANIT PREGL
VOM WASSER
VOPR MED KHIM
VOPR ONKOL
VOPR PITAN
VRACH DELO
WATER AIR SOIL POLLUT
WATER POLLUT CONTROL
WATER RES
WATER RESOUR BULL
WATER RESOUR RES
WEED RES
WEED SCI
WHO CHRONICLE
WHO TECH REP SER
WIAD LEK
WIAD PARAZYTOL
WIEN KLIN WOCHENSCHR
WIEN TIERAERZTL MONATSSCHR
WIRE J
WISS Z UNIV ROSTOCK MATH-NATURW
XENOBIOTICA
YAKUGAKU ZASSHI (J PHARM SOC JPN)
YAMAGUCHI-KEN EISEI KENKYUSHO NENPO
YAMANSHI-KEN EISEI KOGAI KENKYU
YUKAGAKU (J JPN OIL CHEM SOC)
Z ALLG MIKROBIOL
Z ALLGEMEINMED
Z ANGEW ENTOMOL
Z CHEM
Z ERKR ATMUNGSORGANE
Z ERNAEHRUNGSWISS
Z GESAMTE HYG IHRE GRENZGEB
Z GESAMTE INN MED IHRE GRENZGEB
Z HAUTKR
Z JAGDWISSENSCH
Z LEBENSM-UNTERS-FORSCH
Z NATURFORSCH
Z PARASITENKD
Z PFLANZENKR PFLANZENSCHUTZ
Z RECHTSMED
Z THER
Z VERSUCHSTIERK
Z WASSER ABWASSER FORSCH
ZASHCH RAST (MOSCOW)
ZASSO KENKYU (WEED RES (TOKYO))
ZAVOD LAB
ZDRAVOOKHR TADZH
ZDRAVOOKHRANENIE
ZENTRALBL BAKTERIOL ABT I
ZENTRALBL BAKTERIOL ABT II
ZENTRALBL VETERINAERMED
ZENTRALBL VETERINAERMED REIHE A
ZESZ NAUK AKAD ROLN SZCZECINIE
ZESZ NAUK WYZSZ SZK ROLN WROCLAWIU ROLN
ZH ANAL KHIM

78-0001. Bulla, L. A. ; Rhodes, R. A.; Grant, S. J. (U. S. Grain Marketing Res. Cen., ARS, USDA, Manhattan, KS 66502) **Bacteria as insect pathogens.** *Ann. Rev. Microbiol.* 29: 163-190; 1975. (161 references)

A comprehensive treatment of theory, efficacy, safety, and practicability of using microbes (specifically bacteria) as insecticides is presented. Systematics and taxonomy, physiology, and pathology of the insect-pathogen relation are discussed. Knowledge acquired from insect-pathogen studies, besides being useful in the control of insects, will provide a greater understanding of disease and pathogens in general and of the phylogenetic origin of disease.

78-0002. Anonymous. **Environmental studies.** *Building Research Establishment Annual Report* pp. 8-11; 1976.

A portion of this report discussed the work carried out in the area of environmental studies concerning pesticides. Progress over the year in the study of work treatment with preservatives and the possible pollution in the soil, ground-water or air resulting from such activity is reviewed. Additional studies cited include the following areas: the use of copper/chrome/arsenic preservative treatments; a survey of the wastes generated during the formulation and use of organic solvent wood preservatives; legislation applicable to operators of remedial treatments; and studies in the search of safer insecticides.

78-0003. Anonymous. **Cleaning up Seveso: science, politics and chaos.** *Chemistry* 21-22; 1977.

The aftermath of the explosion at Seveso, Italy, in which TCDD was spread throughout an area around a chemical plant is presented. The immediate short term problem was to find a way to decontaminate the area so that approximately 700 evacuees could go home. Even though TCDD is very unstable in ultraviolet light, it was found that the chemical residues were dissipating very slowly. Treatment with an effective hydrogen donor was tried in several areas and the TCDD there decreased rapidly, resulting in the destruction of 90% of the residue within nine days. Problems of decontamination and the political aspect of the situation are considered.

78-0004. Kearney, P. C. (Agr. Environ. Qual. Inst., USDA, Beltsville, MD 20705) **A challenge for controlled release pesticide technology.** *ACS Symp Ser No. 53, Controlled Release Pesticides, H. B. Scher, Editor, ACS, Washington, DC* pp. 30-36; 1977. (14 references)

The purpose of this paper was to challenge scientists engaged in controlled-release technology to consider some of the broader opportunities offered for improving pesticide efficacy and safety. The ability to manipulate the concentration of the toxin presented to the pest and the environment may make some older compounds more attractive commercially and may overcome some problems associated with potentially useful new compounds that otherwise might not be registered. The discussion centers primarily on the organic herbicides. Topics considered include persistence and movement of the chemicals in the environment. Herbicides discussed include barban, CDAA, chlorpropham, 2,4-D, dalapon, EPTC, and propanil. While the most promising challenges for controlled release technology are altering pesticide persistence and movement, other environmental parameters that can be modified or altered by formulation are also considered.

78-0005. Zweig, G. (EPA, Office of Pesticide Programs, Washington, DC 20460) **Environmental aspects of controlled release pesticide formulations.** *ACS Symp. Ser. No. 53, Controlled Release Pesticides, H. B. Scher, Editor, ACS, Washington, DC* pp. 37-53; 1977. (38 references)

A survey of the types of controlled-release formulations of different classes of pesticides is presented in this paper. Some controlled release pesticide formulations have become commercial products, while others are still experimental and feasible but have not been tested. A discussion of the various controlled release matrices has shown that the environmental fate of many inerts is unknown and should be studied before they are introduced into the environment. At the present state of knowledge there do not seem to be serious environmental problems except for possible resistance and toxicity to nontarget populations of beneficial insects.

78-0006. Doull, J. (Univ. Kansas Med. Cent., Kansas City, KS 66103) **Clinical toxicology aspects of controlled release pesticide formulations.** *ACS Symp. Ser. No. 53, Controlled Release Pesticides, H. B. Scher, Editor, ACS, Washington, DC* pp. 54-59; 1977. (5 references)

Some speculation is offered on how the use of microencapsulated pesticides might affect the incidence and severity of pesticide poisoning, and efforts are made to identify some of the problems that emergency room physicians may have to deal with in the event that these agents receive widespread commercial usage. The incidence and causes of pesticide poisoning in the United States over the past 40 years is briefly reviewed. Specific attention is given to the heavy metals as the chief cause of pesticide poisoning, with arsenic as the number one problem in the pre-DDT phase of pesticide poisoning. Attention is also given to the DDT problem and finally to the problems which occurred through the use of compounds like parathion or paraquat after DDT was no longer allowed to be used. The prevention of pesticide poisoning and possible toxicologic problems encountered with microencapsulated pesticides are discussed.

78-0007. Fowler, B. A. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709) **International conference on environmental arsenic: an overview.** *Environ. Health Perspect.* 19: 239-242; 1977.

An international conference on arsenic as an environmental toxicant met in Fort Lauderdale, Florida during October 5-8, 1976. The meeting was divided into sessions dealing with methods and problems of analysis, sources of environmental pollution, occurrence and transformation in

nature, effects and dose-response relationships in animals. Various analytical techniques with low detection limits are available for the speciation of some arsenicals in air and water. Important sources for emission of arsenic into the environment include nonferrous smelting operations, coal-fired power plants using arsenic-rich coal, and natural sources such as volcanoes and hotsprings. The methylation-demethylation cycle of arsenic in the environment is essential to predicting possible hazards from this element, and a number of acute, subacute, and chronic incidents of mass human arsenic poisoning were discussed. The latter usually occurred as a result of arsenic exposure via contaminated drinking water or food. Poisoning resulted in skin changes, vascular changes, Raynaud's phenomenon, acrocyanosis, central and peripheral neuropathy, skin and lung cancer, possible hearing changes, and retarded growth development in children. Differences in race, climate, and nutrition may account for the disparity in findings in different cases. The chemical speciation of arsenic changes after the intake of inorganic arsenicals, and the in vivo metabolism and toxicity of arsenic is potentially mediated by a number of other elements. Recommendations for future research were made after each session.

78-0008. Vuori, E. ; Tyllinen, H.; Kuitunen, P.; Paganus, A. (Children's Hosp., Dept. Public Health Sci., Univ. Helsinki, Finland) **The occurrence and origin of DDT in human milk.** *Acta Paediatr. Scand.* 66(6): 761-765; 1977. (16 references)

Analyses were made of the content of organochlorine compounds in 49 human milk samples, along with an investigation of the possible sources of DDT in human beings. The samples were analyzed by gas chromatographic methods. The average total DDT content in the human milk samples was 0.058 mg/kg with a range of 0.017-0.17 mg/kg (1.57 mg/kg milk fat, with a range of 0.50 to 4.00 mg/kg). Traces of dieldrin reached 0.008 mg/kg in one sample only. The average PCB content was 0.024 mg/kg of human milk, with a ratio of 0.011 to 0.054 mg/kg (0.65 mg/kg of milk fat with a range of 0.33 to 1.10 mg/kg). The ratio of DDT metabolites to DDT varied from 1.1 to 7.8 with a mean of 2.8. The effect of the weight, weight loss, diet, smoking habits and parity of the nursing mother on the content of organochlorine compounds in the milk were also studied. It was noted that there is a significant positive correlation between the DDT content of human milk fat and cigarette smoking. The average daily intake of total DDT for Finnish breastfed babies was estimated at 0.0093 mg/kg. This value is 1.9 times greater than the daily intake of 0.005 mg/kg indicated by the FAO/WHO as the value which is acceptable.

78-0009. Luquet, F. M. ; Goursaud, J.; Casalis, J. (Lab. Ind. Laitiere, ENSIA, Douai, France) **Pollution des laits et produits laitiers en France per les residus de pesticides organochlores. Evolution. Origine. Lutte. [Pollution of French milk and dairy products by organochlorine pesticide residues. Evolution, Origin, Control.]** *Alim. Vie* 67(1): 3-11; 1975. (French)

Results of organochlorine pesticide residue analyses in French milk and dairy products are presented. In cow's milk the residue levels have shown a considerable decline from 1969 to 1972; the latest residue levels measured during the winter of 1972/1973 are 0.2-0.3 mg/kg for total BHC and hexachlorobenzene (fat basis), 0.15 mg/kg for heptachlor and heptachlor epoxide, 0.05 mg/kg for aldrin and dieldrin, and 0.08 mg/kg for DDT and its metabolites. The heptachlor epoxide level, however, shows a marked increase from 1970 to 1973. Lindane and BHC are the principal pollutants in ewe's milk; the overall pollution level was 0.12 mg/kg in late 1972. Heptachlor, heptachlor epoxide and DDT were also found in ewe's milk. BHC (0.08-0.23 mg/kg) and lindane (0.12 mg/kg) are the principal pollutants in goat's milk. Cows were fed feed and forage with known organochlorine pesticide levels in an experiment to determine their passage into the milk. The correlation between the residue levels measured in feed and milk was closest for heptachlor epoxide, weaker for aldrin, dieldrin, and weakest for α-BHC and lindane.

78-0010. Richou-Bac, L. ; Restuit, A.; Pantaleon, J. (Lab. Centr. Hyg. Aliment., Min. Agric. 75015 Paris, France) **Residus de pesticides dans les aliments pour animaux. Evaluation des normes de tolerance. [Pesticide residues in animal feed: Evaluation of standards.]** *Bull. Acad. Vet. France* 48(9/10): 483-497; 1975. (11 references) (French)

Present standards applicable to organochlorine pesticide residues in animal feed are assessed. Such standards are established with respect to the maximum allowable residue concentrations established for human food of animal origin, and the rate of transfer of pesticides from animal feed into animal tissues and organs (meat, milk, eggs). The rate of transfer was found to be dependent on the animal species, the type of pesticide, and the organ or tissue into which the residue is transferred. While it is relatively easy to keep the residue levels of lindane and DDT below the respective standards of 0.2 ppm and 0.1 ppm in animal feed, it is difficult to observe the standards set for cyclodienes, beta-BHC, and hexachlorobenzene (0.02-0.03 ppm). Considerable reduction of the α-BHC, β-BHC, heptachlor epoxide, and dieldrin levels has been observed in France during the last 5 years. The lindane and hexachlorobenzene levels have been low but rather steady.

78-0011. Sirons, G. J. ; Frank, R.; Dell, R. M. (Provincial Pestic. Residue Testing Lab., Ontario Ministry Agric. Food, Guelph, Ontario, Canada) **Picloram residues in sprayed Macdonald-Cartier Freeway right-of-way.** *Bull. Environ. Contam. Toxicol.* 18(5): 526-533; 1977. (8 references)

The persistence and movement of picloram applied to the median and shoulders of a major highway were investigated. The herbicide formulation (Tordon 101) was mixed with a particulating agent (Norbak) and applied at rate of 350 g picloram/ha to the right-of-way of the Macdonald-Cartier Freeway in Ontario, Canada. The applications were repated in alternate years for 7 hr, and soil core and grass samples were collected twice each summer from seven locations. Analysis was by electron capture gas chromatography. Under the climatic conditions of southwestern Ontario, the picloram began to move vertically down the soil profile immediately after application. Within 12 mo, the pesticide was substantially dispersed, and after 30 mo, it was sufficiently diluted to exist only as a trace. Lateral movement was not observed. Application of picloram in alternate years would lead to a slow rise in soil concentrations and the eventual endangerment of the shrubs and trees growing nearby. Application of picloram at rates up to 350 g active ingredient/ha every 3 yr would be adequate for brush control and would not contaminate the surrounding area or build up in the top 50 cm of soil.

78-0012. Bjorseth, A. ; Lunde, G.; Dybing, E. (Central Inst. Ind. Res., Oslo, Norway) **Residues of persistent chlorinated hydrocarbons in human tissues as studied by neutron activation analysis and gas chromatography.** *Bull. Environ. Contam. Toxicol.* 18(5): 581-587; 1977. (6 references)

Electron capture gas chromatography (GC) and neutron activation analysis (NAA) were used to determine the concentrations of HCB, PCB, and *p,p'*-DDE in samples of liver and adipose tissue taken at autopsy from 10 Norwegian

subjects. Residues of HCB, PCB, and *p,p'*-DDE were present in all of the samples. The average organochlorine levels in fat and liver were 1.77 ppm and 2.08 ppm, respectively, whereas organobromine levels were always less than 0.03 ppm. Organoiodine compounds were not detected and, if present, were present in concentrations less than 1 ppb in extractable fat. DDT, DDD, dieldrin, the BHC-isomers, and other chlorinated hydrocarbons were occasionally found, but apparentaly contributed only a small part of the total burden of chlorinated hydrocarbons. Comparison with previous studies indicates that the fat levels of PCB and DDE in Norwegians were lower than in Danes or Germans, and that the liver concentrations in the Norwegians were lower than those reported in Danes. The levels of HCB in Norwegians appeared to be significantly lower than in German subjects.

78-0013. Baird, R. C. ; Thompson, N. P.; Hopkins, R. L.; Weiss, W. R. (Author address not given) **Chlorinated hydrocarbons in mesopelagic fishes of the eastern Gulf of Mexico.** *Bull. Mar. Sci.* 25(4): 473-481; 1975. (32 references)

In order to assess chlorinated hydrocarbons in mesopelagic fishes of the eastern gulf of Mexico, 1052 fishes representing 17 species and selected zooplankton collections from the eastern and northern Gulf were analyzed for DDT, DDD, DDE, dieldrin, and PCB. DDT and its metabolites were generally found at concentrations less than 0.01 ppm by weight. Dieldrin was found in fishes more sporadically but at somewhat higher concentrations. PCB was ubiquitous in the fishes at concentrations one to two orders of magnitude higher than the pesticide residues, but generally less than 1 ppm. Analysis of the feeding patterns of the different species suggests that dietary intake is an important source of organochlorine residues in mesopelagic fishes. Until more is known about organochlorine (especially PCB), metabolism and tolerances in fishes, the continued introduction of these chemicals into the oceans should be monitored.

78-0014. Mikulik, A. ; Vavrova, M. (Natl. Inst. Vet., Brno, Czechoslovakia) **Vliv kekterych technologichych procesu na heptachlor ve veproven mase. [The effect of some technological process on heptachlor in pork meat.]** *Cesk. Hyg.* 20(6-7): 292-299; 1975. (14 references) (Czech)

Heptachlor was fed to pigs for 10 weeks and was metabolized to heptachlor epoxide and stored mainly in fatty tissues. After thin-layer chromatographic determination of heptachlor epoxide in the raw tissues (fat and muscle), the effect of some technological processes on the levels of its residues in final products was studied, mostly after long-term storage. The technology of the production of sausages, smoking, preservation and broiling of lard under defined conditions did not decrease the level of heptachlor epoxide residues, but on the contrary caused a several-fold concentration in the final products. Only boiling mostly caused a uniform quantitative distribution of the residues of heptachlor epoxide between the boiled tissue and the broth. In two cases, a 50% decrease and in one case an uneven decrease of heptachlor epoxide in the boiled tissue indicated a possibility of using boiling as a process for effectively decreasing the residues of heptachlor epoxide in the pork meat under the presumption of discarding the broth.

78-0015. Arbetova, D. ; Uhnak, J.; Mahelova, H.; Skupenova, V. (Reg. Hyg. Stn. Banska Bystrica, Czechoslovakia) **Kontaminacia potavinoveho retazca chlorovanymi insekticidmi na strednom Slovensku. [Contamination of the food chain by chlorinated insecticides in central Slovakia.]** *Cesk. Hyg.* 20(8): 359-368; 1975. (8 references) (Czech)

Pesticide contamination of the food chain in central Slovakia was studied during 1972-1973. Levels of DDT, DDE, γ-BHC, β-BHC, and lindane was measured in water, soil, potatoes, fodder, daily diet, eggs, butter, and human breast milk. Bioaccumulation of BHC was more pronounced than that of DDT. Human breast milk contained approximately 300% of the recommended acceptable daily intake (ADI) of DDT and 50% of the ADI for lindane.

78-0016. Madarie, A. ; Pajed, I.; Hermely, V.; Doktorova, S. (Natl. Inst. Hyg., Bratislava, Czechoslovakia) **Kontaminacia potavinovehi retazca chlorovanymi insekticidmi na vychodnom slovensku. [Contamination of the food chain by chlorinated insecticides in eastern Slovakia.]** *Cesk. Hyg.* 20(8): 369-376; 1975. (5 references) (Czech)

The contamination of the food chain in eastern Slovakia by chlorinated pesticides residues during 1972-1973 was studied. Median levels of DDT and DDE in the soil ranged between 0.11 and 0.18 mg/kg. Foodstuffs of vegetable origin had residue levels of these pesticides which were an order of magnitude lower, while residue levels in foodstuffs of animal origin were comparable to those found in the soil. DDt and DDE residue levels of mother's milk were 7.51 mg/kg. Residue levels of γ- and β-BHC in soil and foodstuffs of vegetale origin were on the order of .001 mg/kg, while levels averaged .01 mg/kg in butter and 0.645 mg/kg in human breast milk. Of all these residues, only the levels of DDT exceeded the recommended daily acceptable intake (ADI) (161% ADI) calcualted from the average consumption in the daily diet. These studies indicate that BHC (especially β -BHC) residues accumulate in the food chain more rapidly than DDT residues.

78-0017. Uhnak, J. ; Sackmauerova, M.; Tibenska, M.; Palusova, O. (Natl. Inst. Hyg. Bratislava, Czechoslovakia) **Kontaminacia potavinoveho retazca chlorovanymi insekticidmi v oblasti Bratislavy. [Contamination of the food chain by chlorinated insecticides in the area of Bratislava.]** *Cesk. Hyg.* 20(8): 377-384; 1975. (5 references) (Czech)

The contamination of the Bratislava area with agricultural chemicals was investigated. Residues of DDT and DDE as well as those of β-BHC and γ-BHC (lindane) were studied. DDT and DDE residues were greater than the levels of β-BHC and γ-BHC in all food links with the exception of drinking water. The contents of insecticide residues in drinking water were three orders of magnitude lower than

in the food. Residues of total DDT in the soil were in the range of 0.050-0.096 mg/kg of median values. Pesticide content in potatoes and daily diet did not reach the level in the soil, but in foods of animal origin DDT was several-fold over the values in the soil. Mothers' milk contained 7.095 to 7.525 mg/kg*p,p'*-DDT and DDE. The relative accumulation of residues of β-BHC and γ-BHC in the food chain in comparison with the soil indicated a different mechanism at work than with DDT and DDE. Human exposure to chlorinated insecticides as calculated on the basis of consumption of the observed food in median values appeared to be 13.36% of the ADI value for the sum of DDT and 1.09% of the ADI value for γ-BHC. Human exposure, calculated on the basis of daily diet, was 31.66% of the ADI value in median values of DDT and 121.66% of the ADI value in the maxima. The median value of lindane was 1.33% of the ADI and the maximum value was 7.00% ADI. The exposure of sucklings fed on mothers' milk proved to be as high as 450% of the ADI for DDT and 24% of the ADI for lindane.

78-0018. Hruska, J. ; Kocianova, M. (Hyg. Stn., 370 00 Ceske Budejovice, Czechoslovakia.) **Kontaminace potravinoveho retezce chlorovanymi insekticidy v jiznych cechach. [Contamination of the trophic chain by chlorinated insecticides in Southern Bohemia.]** *Cesk. Hyg.* 20(9): 421-428; 1975. (10 references) (Czech)

The accumulation of organochlorine pesticides (BHC and DDT) in the trophic chains in Southern Bohemia was studied by residue analyses in drinking water, soil, potatoes, animal feed, butter, eggs, mother's milk, and the daily diet during the 1972-1973 period. Beta-BHC was found in the daily diet (0.003 mg/kg) and in mothers milk (0.343 mg/kg) only, while lindane was found in all types of samples (0.001-0.003 μg/l in water 0.001-0.004 mg/kg in soil, 0.001 mg/kg in potatoes, 0.002 mg/kg in animal feed and eggs, 0.016 mg/kg in butter, 0.001 mg/kg in the daily diet). There was practically no lindane in mother's milk. The *p,p'*-DDT levels were 0.003-0.006 μg/l in drinking water, 0.004-0.031 mg/kg in soil, 0.002-0.003 mg/kg in potatoes, 0.01-0.003 mg/kg in animal feed 0.018-0.046 mg/kg in eggs, 0.018-0.04 mg/kg in butter, 0.003-0.004 mg/kg in the daily diet, and 0.204-0.169 mg/kg in mother's milk. The *p,p'*-DDE levels were 0.008 μg/l in water (lowest level) and 0.802-1.052 mg/kg in mother's milk (highest level), and a residue level of 0.0076-0.009 mg/kg was found in the daily diet. The calculations performed indicate that 32.8% of ADI is reached for DDT, and 1.1% of ADI for lindane. For breastfed babies, the DDT intake is 141.3% of the ADI, and the total BHC intake is 2.4% of the ADI.

78-0019. Mahelova, E. ; Uhnak, J.; Sackmauerova, M. (Nat. Inst. Hyg., Bratislava, Czechoslovakia) **Hexachlorobenzene residues in the living environment.** *Cesk. Hyg.* 22(6-7): 279-285; 1977. (29 references) (Czech)

The presence of hexachlorobenzene (HCB) residues in the environment is reviewed. The negative effects of HCB on human health are reviewed with specific mention of the incident in Turkey where contaminated wheat was consumed. Although the acute toxicity of HCB is not high, feeding experiments proved that higher dosages result in enlarged liver, spleen, lungs and kidney. The compound also passes through placental tissue into fetuses. The chemical is also accumulated in fat, eggs, liver and muscles. Residues can pass from the soil into plants, and residues are also found in water, fish, and different food products of animal origin used in the whole day food diets of humans. Mother's milk contained an average of 5.3 mg/kg. Similar levels were noted in human fat. The levels noted in Czechoslovakia indicate a considerable contamination of food products of animal origin such as butterfat, as well as of human fat. The present acceptable daily intake and tolerance levels of HCB residues in some kinds of food products as suggested by the FAO and WHO are presented.

78-0020. Parlar, H. ; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch., Munich, Germany) **Photoreactions of cyclodiene insecticides under simulated environmental conditions.** *Chemosphere* 6(10): 665-705; 1977. (89 references)

This paper deals with the photoreaction of cyclodiene insecticides under simulated atmospheric conditions, especially with photomineralization reactions. Photoisomerization reactions of cyclodiene insecticides are specific reactions which have a low activation energy when compared to other photoreactions. The photoisomers are usually more toxic than their corresponding parent compounds. All cyclodiene insecticides contain chlorine, which is responsible for the effectiveness and toxicity of the compounds. Detoxification of the compounds can be achieved by dechlorination in many cases. The reaction of chemicals with various oxidants in the atmosphere plays an important role in the degradation of environmental chemicals. Previous experimentation has shown that, in contrast to some aromatic and aliphatic chlorinated hydrocarbons, the cyclodiene insecticides are under ultraviolet irradiation degraded into carbon dioxide and hydrogen chloride. The presence of these substances in the environment can increase so that the atmosphere becomes a sink for them.

78-0021. Terce, M. ; Lefebvre-Drouet, E.; Calvet, R. (Stn. Sci. Sol. I.N.R.A. Route de St Cyr., Versailles France) **Degradation of adsorbed atrazine on an aluminum montmorillonite.** *Chemosphere* 6(11): 753-758; 1977. (12 references)

The purpose of this study was to estimate the ability of clay surfaces to degrade adsorbed molecules of atrazine. The model adsorbent used was a montmorillonite saturated with aluminum cations and dehydrated by heating at 300°C. With the clay studied here, the adsorbed atrazine underwent only a very small hydrolysis after one year. The majority of the herbicide remained undegraded. However, if the clay is heated, hydrolysis is observable even after 24 hours. Due to the polarizing power of aluminum cations, the surface acidity is greater for an aluminum clay than for a calcium clay. Thus clay minerals are not likely to be at the origin of an important

degradation of atrazine in soil, except perhaps in the upper part of the soil in summer where the temperature may be relatively high.

78-0022. Rajasekharan Pillai, V. N. (Dep. Chem., Univ. Calicut, Kerala 673 635, India) **Role of singlet oxygen in the environmental degradation of chlorthiamid to dichlobenil.** *Chemosphere* 6(11): 777-782; 1977. (13 references)

This paper reports the photochemical investigations of two important benzoic acid herbicides, chlorthiamid, and dichlobenil, carried out under different conditions. The studies revealed that the herbicidal action and the environmental degradation of chlorthiamid might be due to its conversion to dichlobenil by singlet oxygenation and subsequent reactions. The key step in the degradation of chlorthiamid in the plants and in the soil must be the photochemical dye-sensitized singlet oxygenation, the natural photosensitizers such as riboflavin or chlorophylls acting as the dye.

78-0023. Bognar, A. (Inst. fuer Hauswirtsch., Bundesforschunganst. Ernaehrung, 7000 Stuttgart 70, Germany) **Untersuchung zur Verminderung oder Beseitigung von Pflanzenschutzmittelrueckstaenden in pflanzlichen Lebensmitteln durch kuechentechnische Verfahren. [Culinary reduction or elimination of pesticide residues from edible plant products.]** *Dtsch. Lebensmittel-Rundschau* 73(5): 149-157; 1977. (24 references) (German)

The effects of treatment schedule, application rate, and culinary preparation on prometryne residues in carrots, terbutryne and terbuthylazine residues in potatoes, and as well as diazinon and dimethoate levels in French beans and cauliflower were studied. Carrot plots were sprayed with prometryne (1 kg/ha = normal dose, or 1.5 kg/ha), potato fields with terbutryne/terbuthylazine (1.4 and 2.1 kg/ha) 77 days before harvesting, while French beans and cauliflowers were sprayed with diazinon (0.25 kg/ha) 11 days before harvesting, and with dimethoate (0.4 kg/ha) 21 days before harvesting, as required by the regulations. In addition, some bean and cauliflower plots were also sprayed with diazinone and dimethoate 3 and 7 days before harvesting, respectively. The residues were determined gas chromatographically. The pesticide residues measured at harvesting were well below the maximum allowable levels in all plants treated at the proper dates; the residue levels found were 0.011-0.013 ppm for prometryne and terbutryne, 0.011-0.026 ppm for diazinon, and 0.012-0.056 ppm for dimethoate. Late treatment with diazinon and dimethoate caused considerable increases in the residue levels at harvest (0.076-0.13 ppm for diazinon and 0.06-0.29 ppm for dimethoate). It was possible to remove 75-100% of prometryne, 38% of terbutryne, 40-77% of diazinon, and 37-82% of dimethoate from the edible plant products by culinary preparation (cleaning, peeling, washing, cooking, and steaming).

78-0024. Akins, M. B. (Univ. Tennessee, Knoxville, TN) **The adsorption, desorption, and volatility of three dinitroaniline herbicides in soil.** *Diss. Abstr. Inst. B.* 38(2): 443-444; 1977.

The adsorption, desorption, and volatility of dinitramine, fluchloralin and profluralin were investigated in soil. In one set of extractions soils were sequentially extracted with solvents of increasing polarity. The solvents, the components removed and the change in adsorption relative to nontreated samples of the soils were as follows: ether-waxes and oils (+22.0%); ethanol-resins (+34.3%); water-polysaccharides (+0.8%); 2% HCl-hemicellulose (+38.2%); and 80% H_2SO_4-cellulose (+77.2%). In a second set of extractions the solvents, the components removed and the effect on adsorption relative to the nontreated samples of the soils were as follows; 35% H_2O_2-organic matter (-21.3%); sodium [citrate-dithionite bicarbonate]-free iron oxides (+44.0%); 35% H_2O_2 + sodium [citrate-dithionite bicarbonate]-organic matter & free iron oxides (+576.5%). Adsorption was directly related to the soils' organic matter content and the length of the aniline sidechain. Average percent of the adsorbed herbicides desorbed by the five rinses was 32.4, 31.0, and 15.1% for dinitramine, fluchloralin, and profluralin. The effects of herbicidal properties, herbicide rates (12.5 and 25 μg/50 g), soil moisture (25, 50, 75, and 100% of field capacity-FC) and temperature (greenhouse-average maximum daytime temperature 38°C, laboratory-average maximum temperature 25°C) on volatilization of herbicides from soil were investigated. The average loss of herbicides 14 days after application for the 12.5 μg rate was 43.1, 23.9, and 17.4% for dinitramine, fluchloralin, and profluralin, respectively. Slightly lower values (37.7, 21.7, and 16.0%) were observed for the 25 μg rate. Increasing the soil moisture content increased volatilization substantially for all three herbicides. (Author abstract reprinted by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 77-16, 568.)

78-0025. Dao, T. H. (Univ. Nebraska, Lincoln, NB) **Factors affecting atrazine adsorption, degradation, and mobility in soil.** *Diss. Abstr. Int. B.* 38(5): 1983; 1977.

Experiments were conducted to study the processes of adsorption, degradation, and leaching of atrazine and the interrelationship of these processes in soil. Adsorption isotherms for atrazine were described by the Freundlich equation. Decrease in water:soil ratio from 5:1 to 0.4:1 and in soil moisture content from 0.1 to 0.3 bar moisture content led to an increas in adsorption of atrazine on soil. Increasing the concentration of electrolyte added to soil increased atrazine adsorption by reducing the solubility of the herbicide in solution. Increasing soil temperature from 5°C to 30°C increased atrazine adsorption on soil. The pattern of degradation of 1.5 ppm atrazine in soil was characteristic of non-biological processes in soil at 0.1 bar moisture content. The degradation of ring-^{14}C-atrazine to $^{14}CO_2$ was less than 0.05% after eight months at 30°C. Ethanolamine (2-amino-ethanol) was used as an exchanger for atrazine and hydroxyatrazine. It was found that as time passed, the unextractable fraction remaining in soil increased. In the soil extract, the hydroxylated atrazine analog (toluene-insoluble) fraction increased with time, and made up more than 60% of the extracted radio-

labeled fraction after one month of incubation at 30°C. Simultaneous degradation and fixation occurred during the leaching of atrazine through soil with 30 cm of water. Decreasing the water flow rates from 2 cm/hr to 1 cm/day greatly reduced the mobility of atrazine in saturated soil columns. The contribution of the diffusion process to the overall movement of atrazine in soil was estimated to be small. The diffusion coefficients of atrazine in saturated soils were found to be in order of 0.2 to 1.1 x 10^{-7} cm^2/sec. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, order No. 77-23, 132).

78-0026. Haile, C. L. (Univ. Wisconsin, Madison, WI) **Chlorinated hydrocarbons in the Lake Ontario and Lake Michigan ecosystems.** *Diss. Abstr. Int. B.* 38(6): 2699-B; 1977.

To aid in assessing the risk of halogenated organic microcontaminants to the resources of Lake Ontario and Lake Michigan, a qualitative survey of fish from both lakes was conducted to provide an early warning of the accumulation of previously unidentified contaminants. The compositions of the PCB residues in fish from both lakes were strikingly similar, likely reflecting the ubiquity of PCBs in the environment. However, several highly chlorinated compounds, including hexachlorobenzene and octachlorostyrene, were identified in the Lake Ontario fish only, indicating the more limited distribution of these contaminants. Although PCB and DDT residues were typically measured in Lake Michigan water at several nanograms per liter (parts per trillion), their contributions to the whole lake burdens were 80 and 75%, respectively. DDT residue levels measured in Lake Michigan fish are 60 to 80% less than those reported during the late 1960's, likely reflecting the decreased use of DDT during this period and suggesting a relatively short residence time for DDT residues in the lake. A fractionation of PCB residues in Lake Michigan waters showed that nearly 60% were associated with particulates that could be settled by centrifugation and the mean settling flux for PCB residues in Lake Michigan was estimated at ca. 25 $\mu g/m^2$ -yr, based on laboratory settling experiments. From these data and contaminant measurements on the lake a mean sedimentation rate for DDT residues of ca. 40 $\mu g/m^2$-yr was estimated. The residence time for these contaminants based solely on removal by sedimentation are on the order of 100 years. Since the hydraulic residence time for Lake Michigan is also near 100 years, it is unlikely that the short residence time for DDT residues resulted from a combination of sedimentation and hydraulic washout of DDT residues from the lake water. (Author abstract by permission. Copies of the thesis are available from University Microfilms, order No. 77-19, 709).

78-0027. Jelinek, C. F. ; Corneliussen, P. (Bureau of Foods, FDA, 200 C St., S.W., Washington, DC 20204) **Levels of arsenic in the United States food supply.** *Environ. Health. Perspect.* 19: 83-87; 1977. (1 reference)

This report summarizes the results FDA has obtained in recent years in monitoring for arsenic in foods. Neither the toxicological aspects of arsenic nor details of analytical methodology are discussed in detail, but they are referred to as they are related to the monitoring activities. The only regulatory levels presently in force for arsenic in foods in the United States are the tolerances which have been established for its residues in specified foods which results from the application of arsenical pesticides on food and feed crops and from animal feed additives. FDA has monitored for arsenic in its Total Diet Survey since the inception of this program. The data from the program indicate that the average daily intake for arsenic as arsenic trioxide has decreased from about 130 micrograms per day in 1968 to about 20 micrograms per day in 1974. Most of the arsenic taken in in the diet is found in meat-fish-poultry food class of the total diet. In individual foods the highest levels were found in fish, with a mean level of about 1.5 ppm as arsenic trioxide in the edible portion of finfish. Lower levels occurred in all the other food types which were analyzed. Of these the highest levels found were a mean level of 0.08 ppm in chicken and a level of 0.16 ppm in rice. Toxicologists from the FDA do not feel that the average daily intake of arsenic, or its levels in the different food commodities, pose a hazard to the consumer.

78-0028. Nelson, K. W. (ASARCO Inc., New York, NY 10005) **Industrial contributions of arsenic to the environment.** *Environ. Health Perspect.* 19: 31-34; 1977. (2 references)

Industrial contributions of arsenic to the environment are reviewed. Arsenic, being present in all copper, lead, and zinc sulfide ores, is carried along with these metals in the mining, milling, and concentrating processes performed on these metals. At the smelters, separation, final concentration and refining of the by-product arsenic trioxide is achieved. Many compounds important and widely used in agriculture and wood preservation have arsenic as an essential element. Lesser amounts are used in the areas of metal alloys, glass-making, and feed additives. No significant recycling of arsenic is practiced. Current levels of arsenic emissions to the atmosphere from smelters and power plants and ambient air concentrations are given as data of interest in the preservation of the environment.

78-0029. Anonymous **Tracing the fate of pesticides.** *Farm Chem.* 140(11): 64-65; 1977.

Laboratory "agroecosystems" developed at the Beltsville, MD Agricultural Research Center simulate field conditions, making it possible to easily and inexpensively measure pesticide residues in soil, plants, and air simultaneously throughout the year. The five systems now in operation each consist of a large rectangular glass chamber and an air exhaust manifold with a suction fan. The agroecosystems simulate natural air currents and can provide accurate measurements of pesticides in water leached through the soil and run-off water. They can also be used to gauge persistence in plant tissue and soil. A new method for sampling air for residue determinations has been incorporated into the systems' design, and the chambers are large enough to culture most crop plants to maturity. Long-term objectives include

the determination of pesticide bioaccumulation in terrestrial organisms and hooking up the agroecosystems with other model ecosystems, particularly aquatic models. The ultimate goal is the reduction of pesticide movement in the environment.

78-0030. Walsh, L. M. ; Sumner, M. E.; Keeney, D. R. (Dept. Soil Sci., Univ. Wisconsin, Madison, WI 53706) **Occurrence and distribution of arsenic in soil and plants.** *Environ Health Perspect.* 19: 67-71; 1977. (42 references)

Over a period of many years, inorganic arsenicals have been used in the fields of agriculture as pesticides or defoliants. In local areas oxides of arsenic have contaminated soils due to fallout from ore-smelting operations and coal-fired power plants. The use of inorganic arsenicals is not permitted now in most agricultural operations, and contamination from smelters has been cut by legislation. The effect of past accumulations of arsenic in the soil, the phytotoxicity of this substance to the plants, and its uptake by plants as influenced by soil properties are considered, along with the attenuation of the deleterious effects of arsenic. Once they have been incorporated into the soil, inorganic arsenical pesticides and arsenic oxides revert to arsenates, except under specific conditions. Arsenic is not readily leached into the soil and thus remains available to the plants. Methods for estimating plant available arsenic involve extraction of the soil with reagents used to estimate phosphorus availability. Alleviation of arsenic phytotoxicity has been attempted by increasing the soil pH, by use of iron or aluminum sulfate, by desorbing arsenate with phosphate and subsequent leaching, and by cultural practices such as deep plowing. As these attempts have not been very successful, excessive addition of arsenic to soils should be avoided.

78-0031. Karppanen, E.; ; Henriksson, K. **Kvicksilver-och klorerade kolvatehalter i haus - och insjosalar. [Residues of mercury and chlorinated hydrocarbons in marine and lake seals.]** *Finsk Veterinartidskr.* 80(7/8): 378-391; 1974. (10 references) (Swedish)

Mercury and chlorinated hydrocarbon residues were measured in ringed seals (*Pusa hispida*) and grey seals (*Halichoerus grypus*). Analyses were conducted at the State Veterinary Medical institute in Helsinkin on 42 seals between 1969 and 1973. The seals studied were taken from the Gulf of Finland and the Gulf of Bothnia as well as from the Sainaa Lake system and Ladoga Lake. Smaller populations of ringed seals are found in these latter areas as relicts from the glacial period. Total DDT residues in muscle, liver, kidney, and subcutaneous fat of ringed seals from the Gulf of Finland exceeded 250 ppm. Residues from other geographical areas were lower.

78-0032. Srivastava, B. P. ; Mathur, M. C.; Kathpal, T. S.; Nath, G. (Coll. Agr., Univ. Udaipur, Udaipur, India 313001) **Control of fig midge by endosulfan and its residues in and on fig fruits.** *Indian J. Agric. Sci.* 45(7): 287-290; 1975. (11 references)

Studies were conducted to determine whether two sprays of 0.1% endosulfan at 15 day intervals would be enough protection for fruits on fig trees and eliminate the need for three sprays. The results of the studies indicated that two sprays of 0.1% endosulfan made at fortnightly intervals and starting when fig fruits were smaller than peas were as effective as three sprays at the same interval in controlling the midge, *Udumbaria nainiensis* Grover. Residues in and on fig fruits resulting from the two as well as from the three sprayings dissipated below the tolerance level of 2 ppm within 15 days and below the detectable level within 30 days after the last application.

78-0033. Chawla, R. P. ; Joia, B. S.; Kalra, R. L. (Punjab Univ., Ludhiana, India) **Lindane residues in onion, following its granular application for the control of onion maggot.** *Ind. J. Agr. Sci.* 45(11/12): 503-505; 1975. (11 references)

Lindane granules (6%) were applied by broadcast at a rate of 12.5 kg/ha to a transplanted onion crop for control of the onion maggot (*Hylema sp.*). Samples of the top 30 cm of treated and untreated soil were collected before, immediately after, and 19 and 84 days after application, and samples of the onion tops and bulbs were collected at the green edible stage (after 59 days) and at maturity (after 84 days). The samples were analyzed using electron capture gas chromatography. The recoveries of lindane from the plant and soil samples ranged from 71.4-87.4%. The initial level of insecticide in the soil was 0.079 ppm, and it slowly decreased to 0.029 ppm at 84 days. Only a slight leaching was noted in the loamy sand soil. The residue levels in the bulbs and tops at 59 days were 0.147 and 0.115 ppm, respectively, and at 84 days the were 0.019 and 0.139 ppm, respectively. The levels in the plants were suggestive of translocation of the pesticide, although the possibility of contamination of the bulbs from the soil cannot be ruled out. The maximum residues of 0.15 ppm in the onions would represent a level of 0.015 mg/100 g of the food, which is about 1/40 of the maximum safe level. Thus, lindane applied at the rate used in this study can achieve control of the onion maggot without leading to hazardous residue levels in the plants.

78-0034. Marhsall, W. D. ; Singh, J. (Chem. Biol. Res. Inst. Agric., Can., Ottawa, Ontario Can. K1AOC6) **Oxidative inactivation of ethylenethiourea by hypochlorite in alkaline medium.** *J. Agric. Food Chem.* 25(6): 1316-1320; 1977. (23 references)

The mechanism of hypochlorite mediated oxidation of ethylenethiourea (ETU) (I) to ethyleneurea (EU) (II) was investigated. Evidence is presented which suggests a sequential oxidation of ETU in aqueous base to a sulfenate, a sulfinate, a sulfonate, and finally to EU and sulfate. Although rapid and complete when using hypochlorite, the reaction is incomplete when using hydrogen peroxide, ETU being oxidized to the level of a sulfonate only. The synthesis of intermediates are detailed. Oxidation in alkaline medium is proposed as a technique for decontaminating surface residues of ETU on agricultural products. (Author abstract reprinted by permission of the American Chemical Society).

78-0035. Choudhry, G. G. ; Sundstrom, G.; Ruzo, L. O.; Hutzinger, O. (Lab. Environ. Chem., Univ. Amsterdam, Amsterdam, The Netherlands) **Photochemistry of chlorinated diphenyl ethers.** *J. Agric. Food Chem.* 25(6): 1371-1376; 1977. (35 references)

The photoreactions of a series of chlorinated diphenyl ethers at wavelengths around 300 nm were investigated as to their photodecomposition rates and products formed. No significant differences in reaction rates were found between chlorodiphenyl ethers with up to four chlorine atoms per molecule which reacted slower than the pentachlorodiphenyl ethers investigated. The major products resulted from photodechlorination reactions but compounds with chlorine substituents in the 2 or 6 positions also gave rise to chlorinated dibenzofurans in about 10% yields. The yields of dibenzofurans were increased in most cases when photolysis was carried out in the presence of acetone. This reaction may also occur under natural conditions in the environment by influence from natural products which have photochemical characteristics similar to that of acetone. Polychlorinated diphenyl ethers have been found in technical chlorophenol preparations. (Author abstract reprinted by permission of the American Chemical Society).

78-0036. Ruzo, L. O. ; Holmstead, R. L.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dept. Entomol. Sci., Univ. Calif., Berkeley, CA 94720) **Pyrethroid photochemistry: decamethrin.** *J. Agric. Food Chem.* 25(6): 1385-1394; 1977. (32 references)

Photolysis of (*S*)-α-cyano -3- phenoxybenzyl *cis*-(1*R*,3*R*)-2,2- dimethyl-3- (2,2-dibromovinyl) cyclopropanecarboxylate (decamethrin) in various solvents using ultraviolet radiation ($\gamma > 290$ nm) results initially in cis-trans isomerization, ester cleavage reactions, and loss of bromine. Cis-trans isomerization is the major reaction of sunlight irradiation in the solid phase on glass or silica gel. An additional process for dilute solutions in methanol exposed to sunlight involves racemization at the α position in the alcohol moiety by both photochemical and ground-state reactions. Twenty-five photoproducts are identified from irradiation of decamethrin or its initial photolytic derivatives. The effects of quenchers, sensitizers, and solvent viscosity on the reaction rate and product distribution implicate processes in decamethrin photodecomposition that include both singlet and triplet excited states and sometimes "cage" type intermediates. Decamethrin undergoes photolysis more readily than two related pyrethroids, NRDC 149 and permethrin. The mixtures of decamethrin photoproducts from solution and solid-phase reactions are less toxic than decamethrin to mice treated intraperitoneally. (Author abstract reprinted by permission of the American Chemical Society).

78-0037. Picer, M.; Picer, N.; Strohal, P. (Cent. for Marine Res., Rudjer Boskovic Inst., Zagreb, Yugoslavia). **Evidence on behaviour of low concentration DDT in laboratory sorption experiments.** *Sci. Total Environ.* 8(2): 159-164; 1977. (6 references)

This work was designed to aid in the use of blank systems in cases where there is considerable adsorption of solutes on walls of vessels. Difficulties have arisen in the past during stadies using blank systems due to adsorption in differeing degrees. The distribution of C-14 labeled DDT between liquid phase and suspended matter was studied in relation to the quantities adsorbed on walls. During these experiments great differences were noted in adsorption of DDT onto the walls of containers when comparing systems in thed presence and absence of suspended particulate matter. The most acceptable results in an investigation of the distribution of DDT between liquid phase and suspended matter were obtained when both the amount of solute adsorbed on suspended matter and the equilibrium concentration in the liquid phase were measured. Where measurements of adsorbed solute on the solid phase were impossible more realistic results were obtained if the solute was only measured in the liquid phase, disregarding blanks.

78-0038. Khan, S. U. ; Marriage, P. B. (Chem. Biol. Res. Inst. Res. Branch, Can. Agric. Ottawa, Ontario, Canada K1A OC6) **Residues of atrazine and its metabolites in an orchard soil and their uptake by oat plants.** *J. Agric. Food Chem.* 25(6): 1408-1413; 1977. (22 references)

Atrazine (2-chloro -4-ethylamino- 6-isopropylamino *s*-triazine) and its metabolites persisted in a peach orchard soil for several years following nine consecutive annual applications of the herbicide at 4.5 kg/ha. Metabolites identified in soil samples taken 2 and 3.5 years after the last application of the herbicide were: deethylatrazine (2-chloro -4-amino- 6-isopropylamino- *s*-triazine), hydroxyatrazine (2-hydroxy- 4-ethylamino- 6-isopropylamino- *s*-triazine), deethylhydroxyatrazine (2-hydroxy- 4-amino-6-isopropyl- amino-*s*-triazine), and deisopropylhydroxyatrazine (2-hydroxy- 4-ethylamino-6-amino-*s*-triazine). Partial *N*-dealkylation and hydrolysis reactions were involved in the breakdown of atrazine in soil. When oats were grown in the orchard soil, metabolites were absorbed as such and underwent detoxification in plant tissues by conjugation. (Author abstract reprinted by permission of the American Chemical Society).

78-0039. Khan, S. U. ; Young, J. C. (Chem. Biol. Res. Inst., Agric. Can., Ottawa, Ontario K1A OC6, Canada) ***N*-nitrosamine formation in soil from the herbicide glyphosate.** *J. Agric. Food Chem.* 25(6): 1430-1432; 1977. (27 references)

Formation of *N*-nitrosoglyphosate was observed when different soils were treated with sodium nitrite and the herbicide glyphosate at elevated levels. The highest yield was noted in soil low in organic matter and clay contents; however, nitrosation was not affected by soil pH. At low levels of glyphosate (5 ppm) and nitrite nitrogen (2 ppm) the formation of *N*-nitrosoglyphosate in soil was not observed. (Author abstract reprinted by permission of the American Chemical Society).

78-0040. Van Houweling, C. D. ; Bixler, W. B.; McDowell, J. R. (Bur. Vet. Med., Food Drug Admin., Rockville, MD 20852) **Role of the Food and Drug Administration con-**

cerning chemical contaminants in animal feeds. *J. Am. Vet. Med. Assoc.* 17(11): 1153-1156; 1977. (6 references)

Chemical contamination of animal feeds and feed ingredients is of concern to the Food and Drug Administration. Contamination by industrial chemicals such as polychlorinated biphenyls and polybrominated biphenyls; heavy metals such as lead, cadmium, and mercury; and pesticides such as dieldrin and chlordane exemplify the problem in feeds and the resulting problem of tissue residues in human foods. (Author abstract by permission).

78-0041. Johnson, P. E. (Dr. M. Brown, Food Nutr. Board, Natl. Acad. Sci., Washington, DC 20418) **Misuse in foods of useful chemicals** *Nutr. Rev.* 35(9): 225-229; 1977. (23 references)

Chemicals used in industry, agriculture, and food processing in recent years have resulted in illness and death of livestock and humans through misuse. Methylmercury fungicides caused illness and death when contaminated grain intended for seed was mistakenly used for livestock feed or human consumption. Hexabrominated biphenyl (PBB), a flame retardant, was shown to be the cause of livestock illness after the PBB was packaged in bags similar to ones used for feed. Addition of ME 18, an antispattering agent, to margarine, and cobalt sulfate to beer caused illness and death in humans. Ignorance or need for food, human error, and use of chemicals without thorough understanding are cited as the causes of these incidents.

78-0042. Owen, R. B., Jr. ; Dimond, J. B.; Getchell, A. S. (Maine Agric. Exp. Stn., Univ. Maine, Orono, ME 04473) **DDT: Persistence in northern spodosols.** *J. Environ. Qual.* 6(4): 359-360; 1977. (11 references)

DDT (dichloro-diphenyl-trichloroethane) was used between 1954 and 1967 for the control of spruce budworm. (*Choristoneura fumiferana*) in northern Maine. Soils originally tested in 1967 were resampled in 1973 and 1976 to help clarify the degree of persistence of DDT in northern spodosols. Soils from areas sprayed three times at 1.12 kg/ha continue to contain up to 4.5 ppm DDT residues 12 years after application. Pesticide levels in the soils sampled in 1973 and 1976 were not significantly different from levels measured in 1967. Also, analyses of soil profile samples through the A and B horizons indicated that >96% of the residues were still located in the 01 and 02 horizons. (Author abstract by permission).

78-0043. Swoboda, A. R. ; Merkle, M. G. (Soil Crop Sci. Dep., Texas A & M Univ., College Station, TX 77843) **Movement of methazole and its degradation products in soils.** *J. Environ. Qual.* 6(4): 385-388; 1977. (6 references)

The movement of methazole tagged with ^{14}C was studied in Lakeland sand, Nacogdoches sandy loam, Norwood clay loam, and Miller clay soils. The herbicide, at a rate equivalent to 3.4 kg/ha, was incubated for 30 days with each soil. The treated soil, equivalent to 2.5 cm in a 15-cm diameter column, was placed on the surface of untreated soil contained in columns. The columns were subsequently leached daily with 1.25 cm of distilled water for 42 days. Very little ^{14}C-activity was detected in the leachate. The percentage of ^{14}C-tagged material added which leached through the soils was 2.75, 0.84, 2.87, and 1.01 for the Lakeland, Nacogdoches, Norwood, and Miller soils, respectively. Upon sectioning the columns, the majority of ^{14}C-active material was found in the 0- to 2.5- and 2.5- to 7.5-cm sections, although a considerable amount of material was found in the 7.5- to 15-cm sections of the Lakeland and Norwood soil columns. Very little herbicide was found below 15 cm in any of the soil columns. Essentially all of the ^{14}C-active material present in the soils could be extracted by either shaking for 2 hours with methanol or refluxing with methanol for 16 hours in a soxhlet extractor. Wet combustion of soil samples indicated that very little ^{14}C-activity remained in the samples extracted by the soxhlet method. Methazole was readily converted to 1-(3,4-dichlorophenyl)- 3-methylurea (DCPMU) and 1(-3,4-dichlorophenyl)urea (DCPU) in the soils studied, with DCPMU being present in the largest quantities. Very little unaltered methazole or unidentified degradation products were detected in the soils. (Author abstract by permission).

78-0044. Supak, J. R. ; Swoboda, A. R.; Dixon, J. B. (Tex. Agric. Ext. Serv., Lubbock, TX 79409) **Volatilization and degradation losses of aldicarb from soils.** *J. Environ. Qual.* 6(4): 413-417; 1977. (13 references)

Aldicarb, 2-methyl-2(methylthio) propionaldehyde *O*-(methyl-carbamoyl) oxime, volatilization from two soils amended with 1 mg toxicant per gram of soil was determined by GLC analysis of trapped pesticide vapors. Volatilization losses were generally depressed by the presence of water and elevated temperatures. Losses ranged from 0.01 to 0.18% of the applied dose during an 18-day period. The highest mortality rates of bioassay organisms subjected to the volatilization vapors were observed at 23C in a soil system being gradually dried by a stream of dry air. Degradation of aldicarb at 23C exceeded 10% of the applied dose only in the acid Beaumont soil, whereas 24 and 46% of the added material degraded in the moist and dry soil, respectively. At 42C, extensive degradation occurred in both acid and calcareous soil systems; losses ranged from 38 to 82% in the moist samples and 61 to 96% in those allowed to dry to an air-dry state. (Author abstract by permission).

78-0045. Mori, Z. ; Tamura, J. (Wakayama Res. Lab., Kao Soap Co., 1334, Minatoyakushubata, Wakayama-shi, Japan) **Studies on removal of residual pesticides from fruits and vegetables by washing.** *J. Food Hyg. Soc. Jpn.* 18(3): 217-224; 1977. (19 references) (Japanese)

The abilities of two types of detergents to remove residual inorganic and organic pesticides from produce were assessed. Pesticide contaminated cabbage, welsh onions, salted cucumbers, grapes, apples, white peaches, and satuma mandarins were washed with a detergent containing a sugar

fatty acid ester and potassium pyrophosphate (Det A), a household kitchen detergent Det B, and water. Inorganic pesticide residues such as Bordeaux mixture, arsenic, lead, and copper were removed most efficiently with Det A. Det B was somewhat more efficient at removing the organic pesticide residues, while water was ineffective (0 to 20% efficiency).

78-0046. Kutz, F. W. ; Yobs, A. R.; Strassman, S. C. (Ecol. Monitoring Br., US EPA, Washington, DC 20460) **Racial stratification of organochlorine insecticide residues in human adipose tissue.** *J. Occupat. Med.* 19(9): 619-622; 1977. (10 references)

This article reports organochlorine residue levels in human adipose tissue collected from the general population on a nation-wide basis in the conterminous United States during fiscal years 1973 and 1974. Data were developed by the National Human Monitoring Programs of the U.S. EPA. Particular emphasis was laid on the racial stratification of the organochlorine insecticide residues. The most marked case of racial difference in residue levels was total DDT equivalent. The tissues from Negroes contained almost twice as much of the combined residue as did tissues from Caucasians. This increased residue level in specimens collected from Negroes was also found when the data were further stratified by census division. Approximately 80% of the total DDT equivalent levels in all races was found as DDE. The racial stratification of the frequency of positive lindane residues also presented a noteworthy situation. Lindane residues were found in samples from Negroes more than twice as often as in samples from Caucasians. There was little racial difference noted for residues of beta-benzene hexachloride (B-BHC), heptachlor epoxide, oxychlordane, or dieldrin. All these chemicals were found at comparatively low concentrations in almost all of the specimens submitted to the program regardless of their racial origins.

78-0047. Suess, A. ; Staerk, H. (Bayerische Landesanstalt fur Bodenkultur und Pflanzenbau, Munich, Germany) **The application of activation analysis for the control of bromide accumulation in vegetable.** *J. Radioanal. Chem.* 37(2): 905-916; 1977. (9 references)

The uptake of bromine by plants under various conditions has been studied to use this fumigation technique for intensive horticulture. The natural bromine content of crops and fruits was in the range of 1 to 5 ppm fresh weight, whereas the highest acceptable level is 50 ppm fresh weight. Using methyl bromide as a soil fumigant, bromine accumulation was found in the crops to levels up to 20-500 ppm in fresh matter. The uptake of bromine differs in various parts of the vegetable crops. The highest bromine concentration was noted in the leaves. Therefore, leaf crops such as lettuce or spinach may accumulate a remarkable amount of bromine if grown on fumigated soils and cause difficulties in respect to food consumption. The efficiency of bromine uptake by plants varied from 1.1 to 9.5% in the first year. The bromine uptake is already reduced in a second rotation in the same year and decreased significantly in the year after fumigation to a range of 5 to 50 ppm, generally remaining below the established tolerance regulation. In the second year the bromine content is similar to the natural level. There may be a possibility of reducing bromine contents if lower fumigation rates or shorter fumigation times are applied.

78-0048. Carter, S. W. ; Duffield, P. A. (Wellcome Res. Labs., Berkhamsted Hill, Herts, England) **Mothproofing with permethrin during dyeing.** *J. Text. Inst.* 68(10): 330-334; 1977. (3 references)

In view of increasing concern about effluent quality, the levels of permethrin in exhausted dye liquors were determined under conventional wool-dyeing operating conditions. Interactions between the mothproofer and some commonly used dyes and auxiliaries were also studied. The study showed indications that high pH values in the dye-bath may cause unacceptable decomposition of the mothproofer. Dye-bath residues of permethrin were very low, except in the presence of Albegal C and Lubrol N-13, and alternatives to these products should be used in mothproofing with permethrin. Permethrin had no significant effect on dye performance and should be compatible with most classes of wool dyes.

78-0049. Mikuriya, H. ; Miyahara, K. (Saga Prefectural Agricultural Experiment Station, Kawazoe, Saga, Japan) **[Pesticide residues in creek water part 2. organophosphorus pesticides.]** *Kyushu Byogaichu Kenkyu Kaiho (Proc. Assoc. Plant Protect., Kyushu)* 23: 106-108; 1977. (Japanese)

It was found that the variations in concentrations of diazinon, *S*-benzyl-diisopropyl phosphorothiolate (IBP), fenitrothion, and disulfoton in the creek water feeding the Chikugo river coincided realtively well with the use practice of these pesticides. IBP showed two peaks in the creek water in mid-July and Aug.-Sept., with a peak of 238 ppm which might be suspected to affect aquatic organisms. After testing crayfish in IBP solution containing 1,000-6,500 ppb, it was established that IBP was harmless to crayfish. Fenitrothion was detected also in July-Aug., with a peak of less than 0.5 ppb. Disulfothion used in seedling boxes before transplanting showed an average of less than 0.3 ppb in creek water. Fish, almost all crucian carp, which live in the creek showed no excessive death rate, and only 0.15% had curved vertebrae. The water in the creek with the above mentioned concentration of pesticides is considered relatively harmless.

78-0050. Kawano, K. ; Harumoto, S.; Nakamura, N. (Miyazaki Prefectural General Experiment Station for Agriculture, Sadowara, Miyazaki, Japan) **[Effects of pesticide dispersed by airplane on waters.]** *Kyushu Byogaichu Kenkyu Kaiho (Proc. Assoc. Plant Protection, Kyushu)* 23: 173; 1977. (Japanese)

Before and immediately, 2 and 7 days after the application of diazinon, 3,5-xylyl *N*-methylcarbamate (XMC) and Organonichol by airplane, water was sampled in paddy fields, irrigation canals, water inlets, and water outlets of paddy fields, and rivers in Miyazaki, and the pesticides determined on the day of application, the maximum concentration

of diazinon was 526-1380 ppb in paddy field, 31.9-142 ppb in the outlet, 41.4-24.5 ppb in irrigation canal, 7.02-57.1 ppb in water inlet. Just after application XMC was 1.5 times the amount of diazinon reflecting the ratio of application; however, diazinon showed more rapid diminution. At 2 days after application, the concentration of diazinon and XMC was less than 3 ppb, and it was less than 0.7 ppb after 7 days. Some damage was seen to loaches in paddy fields with more than 500 ppb (TLm). In rivers, the pesticide concentration became higher than that before application; however, no damage to fish occurred. Since the TLm of diazinon to carp is 8000 ppb, the maximum value of 57 ppb exemplified the safety to the fishes in the river.

78-0051. Riley, J. P. ; Wahby, S. (Dept. Oceanography, Univ. Liverpool, England) **Concentrations of PCBs, dieldrin and DDT residues in marine animals from Liverpool Bay.** *Mar. Pollut. Bull.* 8(1): 9-11; 1977. (11 references)

A study was conducted to obtain data on PCB, dieldrin, and DDT residues present in marine animals from Liverpool Bay. Altogether the residues were examined in 15 species of marine animals. In general, the concentrations of the compounds were somewhat lower than those reported earlier for fish from other British inshore areas, despite the fact that the Bay is subject to pollution, not only from the River Mersey, but also from extensive sewage sludge dumping. This difference may reflect recent controls on the use of these compounds. The levels of the compounds in the organisms from the Liverpool Bay area are well below those which present a hazard to man. Even dieldrin, which unlike PCBs and DDT and its metabolites has a high mammalian toxicity, is present at levels about two orders of magnitude below the concentration of 100 nanograms per gram which has been suggested as its safe upper limit in foods.

78-0052. Wegman, R. C. C. ; Greve, P. A. (Lab. Toxicol., Natl. Inst. Public Health, Bilthoven, The Netherlands) **Levels of organochlorine pesticides and inorganic bromides in human milk.** *Meded. Fac. Landbouwwetensch. Rijksuniv. Gent* 39(2, part 2): 1301-1310; 1974. (11 references)

Organochlorine pesticide and inorganic bromide residues were measured by GLC in human milk samples collected from maternity centers located at eight different regions in the netherlands. The median values of the residues detected in ppm were (on a fat basis): hexachlorobenzene 0.86, γ-BHC 0.01, β-BHC 0.28, lindane 0.02, heptachlor epoxide 0.08, dieldrin 0.11, *p,p'*-DDE 0.42, *o,p'*-DDT 0.42, *p,p'*-DDT 0.73, and TDE 0.01. The bromide level was 2.5 ppm on a whole milk basis. The milk samples used in this study frequently contained pesticide residues in concentrations exceeding the tolerances set for cow's milk; the toxicological significance of these data remains to be evaluated.

78-0053. Anonymous **Disinfectant takes the biscuit** *New Sci.* 76(1081): 623; 1977.

The contamination of foods by a MCPA manufacturing impurity, 6-chloro-o-cresol, is discussed. The contamination is detectable by humans at as small a concentration as 1 drop to 720 tons of biscuit mix. In the particular situation described, minute quantities of the chemical escaping from a herbicide manufacturing plant over three miles away from the biscuit factory gave all the biscuits an antiseptic flavor. Removing the contaminant from the herbicide would be very difficult, and prohibitively expensive.

78-0054. Hayashi, M. ; Kamioka, H.; Omori, S.; Hasami, J. (Dept. Mother and Children Health, National Inst. Public Health, Tokyo, Japan) **[Time change of pollution of human milk by PCB and other substances.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Pub. Health)* 24(10 Suppl.): 581; 1977. (Japanese)

The results of determinations of organochlorine compound levels in human milk fat are summarized. The contents of total BHC, total DDT, dieldrin and PCB (average, median and maximum) were determined in 671, 595, 556, 281, and 258 married women, respectively, in July-August of 1972, 1973, 1974, 1975 and 1976. The average, median and maximum values for total BHC during the test period were 4.15, 2.80 and 33.92 ppm in 1972; 3.49, 2.51 and 24.92 ppm in 1973; 2.12, 1.48, and 12.89 ppm in 1975; 1.99, 1.34 and 19.60 ppm in 1976. The levels of total DDT were 1.99, 1.62 and 11.92 ppm in 1972; 1.99, 1.59 and 12.17 ppm in 1973; 1.75, 1.47 and 9.64 ppm in 1975 and 1.66, 1.29 and 10.96 ppm in 1976. Dieldrin levels were calculated at 0.122, 0.073 and 1.33 ppm in 1972; 0.114, 0.074 and 1.65 ppm in 1973; 0.061, 0.041 and 0.45 ppm in 1975; 0.055, 0.045 and 0.34 ppm in 1976. No values for pesticide residues in human milk were recorded for 1974. A reduction trend in total BHC and dieldrin was exhibited by the Mann-Whitney U test. Only a slight reduction in total DDT was detected. Initially, the pesticide content of milk from women in urban areas was higher than their counterparts in rural regions. Consequently, a steadier reduction of halogenated hydrocarbons was detected in milk samples from urban districts rather than rural districts. dieldrin (average, median and maximum) were determined in 671, 595, 556,

78-0055. Sakai, H. ; Minami, T.; Ishizuki, Y.; Nakayama, H. (Niigata Prefectural Inst. Public Health, Niigata, Japan) **[Time change of organochlorine residues in human milk in Niigata prefecture during past 6 years.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Publ. Health)* 24(10 Suppl.): 582; 1977. (Japanese)

The results of determination of organochlorine pesticide residues in human milk of Niigata Prefecture were outlined as average and standard deviation from 1971 to 1976. The figures, fat basis, of total BHC, total DDT and dieldrin (PCB was omitted in the abstract) were in order, 2.056 $\pm$ 1.107, 2.316 $\pm$ 1.289, 1.788 $\pm$ 0.910, 0.518 $\pm$ 0.205, 1.196 $\pm$ 0.665, and 0.966 $\pm$ 0.912 ppm of total BHC; 1.791 $\pm$ 0.940, 1.852 $\pm$ 1.251, 1.703 $\pm$ 0.853, 0.957 $\pm$ 0.503, 1.292 $\pm$ 0.414 and 1.031 $\pm$ 0.382 ppm of total DDT; and 0.138 $\pm$ 0.095, 0.203 $\pm$ 0.076, 0.219 $\pm$ 0.046, 0.054 $\pm$ 0.036, 0.107 $\pm$ 0.073 and 0.065 $\pm$ 0.023 ppm of dieldrin. It was seen that

total BHC, total DDT and dieldrin in human milk showed a slight reduction with year. In detail, the percentage of beta-BHC in total-BHC increased yearly and the percentage of DDT in total DDT also increased yearly. It was noticed that the standard deviation of total DDT and dieldrin reduced yearly, showing the tendency of reduction of personal difference.

78-0056. Kagechi, Y. ; Uno, M.; Okada, S.; Ueda, E.; Itano, T. (Nara Prefectural Inst. Public Health, Nara, Japan) **[Residues of Fenitrothion dispersed from an airplane, part 2.]** *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 24 (10 Suppl.): 609; 1977. (1 reference) (Japanese)

Total fall-out of fenitrothion scattered from an airplane was determined. It was found that the larger particles have fallen faster and the smaller particles of the pesticide have fallen very slowly. No large difference was found on the amount of fenitrothion fallen and remaining in the air in relatively remote points. Fenitroxon (degradation product in the air) was detected at 4-16 microgram/sq.m.hr. near the scattering point and at 0.2-1 microgram/sw.m. (from 5 am to 12 am). No 5-methyl fenitrothion was detected. It was concluded that (1) smaller particles distribute widely, however, without drift over the aimed area, (2) weather conditions affected the amount of the drift, and (3) fenitroxon was detected as a degradation product.

78-0057. Kasuga, Y. ; Sugitani, S.; Yamada, F. (Gifu Prefectural Institute of Hygiene, Gifu, Japan) **Effects of plant homogenate and light on the degradability of organic phosphorus pesticides.** *Nippon Shokuhin Eisei Gakkai Dai 34-Kai Gakujutsu Koenkai Koen Yoshisyu (Collected Papers Presented at 34th Ann. Meeting, Assoc. of Food Hygiene, Japan)* p. 17; 1977. (1 reference) (Japanese)

In order to determine the effects of plant homogenate and light on the degradability of organic phosphorus pesticides when their residues are determined in actual situations, model experiments were carried out. Dimethoate, diazinon, fenitrothion, phenthoate, malathion, or parathion was added to homogenates of vegetables such as carrot, spinach, Chinese cabbage, turnip, cucumber, etc.; and after incubation the residual pesticide was extracted and determined by gas chromatography. To evaluate the effects of natural light, solutions of dimethoate, diazinon, fenitrothion, phenthoate, malathion, parathion, dichlorvos, fenthion, α-chlorfenvinphos or β-chlorfenvinphos in acetone were left in glass tubes in a room and aliquots determined periodically. The pesticides except for malathion and phenthoate, were not degraded in plant homogenates, Malathion was degraded in the homogenate of carrot, spinach, Chinese cabbage, turnip, leaves of Japanese radish, cucumber, pickling greens, and pimiento fruit. Phenthoate was degraded in the homogenate of leaves of Japanese radish, carrot, cucumber, spinach and turnip. Some degradation was observed by fenthion, dimethoate, and EPN by diffused light, especially fenthion (the amount degraded was 30% in one day at the max. light intensity greater than 3000 lux at 1 pm).

78-0058. Yakushiji, A. ; Watanabe, I.; Kuwahara, K.; Yoshida, S.; Koyama, K.; Kunida, S. (Osaka Prefectural Inst. Public Health, Osaka, Japan) **[Organochlorine pesticide residues in human milk and blood.]** *Nippon Shokuhin Eisei Gakkai Dai 34-Kai Gakujutsu Koenkai Koen Yoshisyu (Collected Papers presented at 34th Annu. Meeting, Assoc. of Food Hygiene, Japan)* p. 35; 1977. (Japanese)

The results of determination of organochlorine pesticide residues in human milk and blood from 1970 to 1977 were presented. The method used followed the officially established one, except that fat was recovered by centrifugation of the water layer after the extraction of fats when the extract (*n*-hexane) was washed with 2% saline. The findings showed the same trend as the results already published by other investigators. The values for β-BHC showed a gradual steady reduction. Other residues such as *p,p'*-DDE, *p,p'*-DDT, and dieldrin showed no remarkable tendency of reduction. The concentration of *p,p'*-DDE in the blood samples of lactating mothers and the concentration of PCBs showed a positive correlation, probably suggesting that their sources are now limited to foods obtained from the ocean.

See also **78-0147** **78-0172** **78-0196**

78-0059. Bouletreau, P. ; Ducluzeau, R.; Bui-Xuan, B.; Petit, P.; Motin, J. (Intensive Care Dept., Hosp. Ed. Herriot, Lyon, France) **Acute renal complications of acute intoxications.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 49-63; 1977. (14 references)

Thirty-one cases of acute renal insufficiency complicating the course of acute intoxications are analyzed. Two cases of paraquat intoxication are considered. Peroxidation of cell membrane lipid by the paraquat free radical is the mechanism of injury. There is early onset of renal impairment, contemporary to digestive impairment. Pulmonary involvement, the most serious complication, occurs later. Clinical aspects and treatment of acute renal failure are presented. Renal insufficiency of indirect mechanism, secondary to humoral or hemodynamic disturbance as a result of voluntary or accidental intoxication, is the predominant form of kidney injury resulting from poisoning. Preventive treatment is useful in these cases and there is room to develop better therapeutic approaches to this problem.

78-0060. Okonek, S. (Cent. Detox. Poisons Inform., Univ. Mainz, Germany) **Hemoperfusion with coated activated charcoal in the treatment of organophosphate poisoning.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 85-90; 1977. (12 references)

In order to assess the effectiveness of therapeutic hemoperfusion, nitrostigmine (parathion 500 ng/ml), demeton-S- methyl sulfoxide (10,000 ng/ml), or dimethoate (10,000 ng/ml) were added to fresh human blood. The contaminated blood was circulated from a thermostated reservoir through a hemoperfusion column at a flow rate of 100 ml/min, and analyzed quantitatively by gas chromatography. The contaminated blood was also hemodialyzed to compare the efficacy of the two methods. Clearance in ml/min by hemodialysis and hemoperfusion, respectively was: nitrostigmine 0.00 and 59.20; Demeton-S- methyl sulfoxide 52.98 and 83.70; and dimethoate 59.07 and 87.74. As a therapeutic measure, hemoperfusion was employed on a patient suffering from acute organophosphate intoxication, and a mean paraoxon clearance of 76.18 ml/min was achieved. The good rates of nitrostigmine and paraoxon elimination favor of the use of hemoperfusion with coated activated charcoal in cases of severe nitrostigmine intoxication.

78-0061. Solfrank, G. ; Mathes, G.; Clarman, M.; Beyer, K. H. (Toxikol. Abt., II. Med. Klin., TU Munchen, Munich, Germany) **Haemoperfusion through activated charcoal in paraquat intoxication.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 91-101; 1977. (3 references)

Clinical experiences in the treatment of nine patients with paraquat intoxication are presented. Seven of nine patients died within 15 days after ingesting quantities of Gramoxone ranging between several ml and 200 ml. In general a large quantity of paraquat ingested will result in death rather rapidly; 3 g of paraquat p.o. seems to be the maximum amount which allows for chances of survival. The clinical picture in these patients is described. Three patients received hemodialysis and 1 was perfused. A comparison of paraquat clearance rates was made between the hemoperfusion patient who had ingested 40 g of paraquat and a hemodialysis patient who had ingested 30 g. When a correction factor was introduced into the calculations of clearance to account for the different dosages, values of 13.13 and 90.30 mg paraquat cleared/hr were obtained for hemodialysis and hemoperfusion, respectively. This indicates that hemoperfusion is 7 times more efficient in removing paraquat than hemodialysis.

78-0062. Vale, J. A. ; Crome, P.; Volans, G. N.; Widdop, B.; Goulding, R. (Poisons Unit, Guy's Hosp., London, S.E. 1, England) **The treatment of paraquat poisoning using oral sorbents and charcoal haemoperfusion.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 109-117; 1977. (12 references)

The clinical course and treatment of 10 patients between the ages of 17 and 76 yr who had ingested between 30 and 300 ml (mean 105 ml) paraquat concentrate is followed. All patients received 250 ml of Fuller's Earth/magnesium sulfate mixture 4x/hr for 24 to 48 hr in an attempt to reduce absorption of the herbicide. Nine patients received initial gastric lavage between 10 min to 3 hr (mean 1.7 hr) after paraquat ingestion. Hemoperfusion was instituted in all patients between 3 hr and 30 hr (mean 11.2 hr) after paraquat ingestion; the mean duration of perfusion was 12.8 hr. Nine patients died between 12 hr and 19 days after ingestion of paraquat; seven died of multiple organ failure (respiratory, kidney, liver, heart failure). The lone patient who survived had allegedly ingested the smallest amount of poison. The actual amounts of paraquat removed during hemoperfusion were low (0.92 ml of paraquat concentrate equivalent) compared to the amounts ingested. It is possible that the therapeutic regime described in this paper might be more satisfactory in less severe cases of paraquat poisoning.

78-0063. Douze, J. M. C. ; Van Heijst, A. N. P. (Dept. Reanimation and Clin. Toxicol., Univ. Hosp. Utrecht, The Netherlands) **The paraquat intoxication--oxygen a real poison.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 241-245; 1977.

A series of animal experiments were performed to prove that oxygen is a real poison in paraquat intoxication. Paraquat was administered to Wistar rats weighing between 175 and 230 g at i.v. doses of between 6.2 and 25 mg/kg. The rats were placed in a controlled environment, fed food and water ad libitum, and were exposed to different atmospheres with oxygen concentrations of 100, 60, 40, 21 (ambient concentration) or 10%. At 100% O_2, all rats died within 12 days with LD_{50}; at 21% O_2, about 65% died within 8 days with LD_{50}; at 10% O_2, about 40% of the rats died within 8 days with LD_{50}. These results demonstrate the harmful effect of oxygen on paraquat intoxication. Controlled hypoxic ventilation to lower the paraquat patient's O_2 tension to between 50 and 70 mm Hg in addition to Fuller's earth/sodium sulfate treatment with hemodialysis should provide for the best possible treatment for paraquat intoxication.

78-0064. Mahieu, P. ; Hassoun, A.; Fautsch, G.; Lauwerijs, R.; Tremouroux, J. (Saint Pieter's Hosp., Univ. Louvain,

Belgium) **Paraquat poisoning. Survival without pulmonary insufficiency after early Bleomycin treatment.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 246-248; 1977.

A case study of a 28-year-old gardener who recovered from ingestion of paraquat concentrate (estimated at 20 ml) is reported. After two gastric washouts the blood paraquat level was measured at 18 μg/100 ml. The therapeutic scheme included forced diuresis for 11 days, peritoneal dialysis for 5 days, daily exchange transfusion for 6 days, progressively decreasing corticotherapy, and 3 injections of 15 mg bleomycin on the 3rd, 4th, and 5th days. The rationale behind this therapy is discussed. At the present time, a combination of gastric washout with absorbents, forced diuresis, prednisone, and antimitotic drugs seems to be the most efficient therapy for paraquat intoxication.

78-0065. Costa, M. C. L. ; Schvartsman, S. (Poison Control Center, Sao Paulo, Brazil) **Antibody titers and blood levels of DDT after diphtheric immunization in children.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 249; 1977.

One to 19 mo after their last routine DPT (diphtheria- pertussis- tetanus) immunization, 28 children, 14 mo to 6 yr of age, had their diphtheria antibody titers tested along with blood levels of total DDT, *p,p,'*-DDT, and *o,p'*-DDE. The results were analyzed to check for possible correlations between antibody titer and blood levels of DDT metabolites. This study shows that the presence of *o,p'*-DDT was related to elevated antibody titers of greater than 11.4 μa/ml.

78-0066. Nantel, A. J. ; Ayotte, L.; Benedetti, J. L.; Savoie, J. Y.; Tessier, L.; Schwarz, T.; Weber, J. P. (Sainte-Foy, Quebec, Canada) **A group of adults acutely poisoned by food contaminated with lindane.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 250; 1977.

Two different groups of people (41 gym teachers, 9 businessmen) ate food in a hotel restaurant on July 7, 1977. During the following hours, most of them complained of nausea, vomiting, diarrhea, headaches, vertigo, and paresthesia. Twenty were hospitalized for about 24 hr because of grand mal seizures. One patient, a 39-yr-old man, suffered from status epilepticus, severe metabolic acidosis, generalized myolysis, acute renal insufficiency secondary to myoglobinuria, acute hypertensive crisis, acute pancreatitis, and superficial vein phlebitis. A diagnosis of lindane intoxication was made from GLC study of the food and from the gastric contents of one patient. Hematological and biochemical profiles together with blood and urine levels of lindane were done on most of the people either immediately or within 3 wk.

78-0067. Velvart, J. ; Lorent, J. P.; Nisoli, A. (Swiss Poison Information Center, Switzerland) **Epidemiology of serious and fatal cases of poisoning in Switzerland.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 459-469; 1977.

An analysis and discussion of the poison problem in Switzerland is presented based on data from the Swiss Poison Control Center from 1966 through 1975, analysis of certificates of death from the Swiss Federal Statistical Bureau, and records of all medical clinics and childrens hospitals in the country. During the period from 1967 to 1974 pesticides were involved in approximately 1.5% of attempted and fatal suicides using chemical agents. Insecticides were the cause of approximately 17.6% (15) of the accidental poisonings occurring in children during the same period. One child fatality occurred due to paraquat poisoning. The poison control center will concentrate its efforts in the future on the development of effective prophylactic measures against the most dangerous poisons as determined in this survey.

78-0068. Pach, J. ; Cholewa, L.; Prochowska, K.; Koczur, A. (Toxicol. Clin. Dept. Epidemiol., Med. Acad., Krakow, Poland) **The epidemiology of acute poisonings in the Krakow region.** *Acta Pharmacol. Toxicol.* 41(Suppl. 2): 528-533; 1977. (5 references)

An epidemiologic survey of acute poisonings which occurred in the Krakow region in the year 1974 is presented. The survey is based on a study of the records of hospitals and clinics in the area. The Krakow area is inhabited by 1,362,075 people, most of whom are rural inhabitants. Out of this population, 1,083 cases of acute poisoning were reported. Data was broken down statistically into numerous categories including sex, age group, time of year, day of week, and nature of poison. Pesticide intoxication accounted for approximately 2% of the acute poisonings reported.

78-0069. Cholewa, L. ; Pach, J.; Prochowska, K.; Koczur, A. (Toxicol. Clin., Med. Acad., Krakow, Poland) **A comparison of the epidemiological data of acute poisonings--obtained in 1972 and 1974 in the city of Krakow.** *Acta Pharmacol. Toxicol.* 41(Suppl 2): 534-542; 1977. (5 references)

Epidemiological data on acute poisonings in the city of Krakow for the years 1972 and 1974 are compared. The data was obtained from case histories and outpatient cards from the Clinic of Toxicology in Krakow. In 1974 fewer than 2% of the acute poisonings observed at the clinic were the result of pesticide ingestion.

78-0070. Hudson, A. J. (Dept. Clin. Neurol. Sci., Univ. Hosp., London, Ontario N6A 5A5, Canada) **Amyotrophic lateral sclerosis and toxic hydrocarbons.** *Arch. Neurol.* 34(11): 721; 1977. (1 reference)

A detailed survey was made into environmental contact with toxic chemicals in six amyotrophic lateral sclerosis subjects (5 men and 1 woman) with onset of disease in their mid-30s. The most common potentially injurious chemicals contacted were liquid petrochemicals such as solvents, fuels, and lubricants; insecticides, notably pyrethrin and organophosphate anticholinesterase compounds, and herbicides, especially 2,4-dichlorophenoxyacetic acid and atrazine. Three of the patients used tobacco and alcohol heavily. Lead exposure was not great, and the serum cholinesterase activity was in the normal range. Although chemical exposure in amyotrophic lateral sclerosis cases does not appear excessive,

it remains uncertain whether toxic chemicals have a potentiating role in the development of the disease.

78-0071. Drasch, G. ; Hauck, G. (Inst. Rechtsmedizin, Ludwig-Maximilians Univ. Muenchen, D-8000 Munich, Germany) **[Monitoring of progress in the intensive treatment of thallium intoxications.]** *Arch. Toxicol.* 38(3): 215; 1977. (15 references) (German)

A report is given on monitoring of the thallium levels during poisoning treatment with forced diuresis and extracorporeal dialysis. The success of these methods was monitored by determining the thallium level in vomitus, blood, urine, and dialysate by flameless atomic absorption spectrophotometry. Since the results are obtained within a few minutes, thallium measurements may be helpful for the decision on the therapy to be applied.

78-0072. Wattel, J. ((Inst. Taxon. Zool. Amsterdam 1004, The Netherlands).) **La mortalite massive des oiseaux aux Pays-Bas. [Massive bird mortality in The Netherlands.]** *Aves (Bruxelles)* 11(4): 169-173; 1974. (6 references) (French)

Recent cases of massive deaths of birds and mammals in the Netherlands are reported. The Sandwich term population of the Waddenzee region dropped from about 30,000 to less than 1,000 breeding pairs. Poisoning by telodrin, dieldrin and endrin discharged in industrial effluents near Rotterdam was determined to have been the cause of the massive deaths. The measures taken to prevent the discharge of such chemical effluents has resulted in an increase of the population to over 2,500 pairs. Massive deaths of birds of prey were observed in the late 60's in Drente and Zeeland Provinces during the winter season. The poisonings were due to the birds' preying on sparrows that had eaten grains treated with seed dressing fungicides (not specified). The investigation of 84 cases of massive deaths of birds in the Netherlands during the 1969-1973 period revealed pesticides as the cause of death in 24. Another survey covering 139 cases of poisonings in birds and mammals from the 1967-1971 period shows that parathion was the cause of the poisoning in 13 cases, other organophosphorus pesticides in 3, and organochlorine pesticides in 4. Most cases of parathion poisoning were intentional.

78-0073. Munk, Z. M. ; Nantel, A. (Dept. Med., Montreal Gen. Hosp., Montreal, Canada) **Acute lindane poisoning with development of muscle necrosis.** *Can. Med. Assoc. J.* 117(9):1050-1051, 1054; 1977. (19 references)

This report describes the clinical and laboratory findings in a man who ingested food accidentally contaminated with lindane and experienced convulsions, severe anemia, renal insufficiency, hypertension, anemia, pancreatitis, and a striking myopathy that has not previously been described in lindane poisoning. The 35-yr-old man developed grand mal seizures and severe acidemia rapidly after ingestion. Seizures recurred for nearly 2 hours. Pancreatitis developed 13 days after ingestion. Muscle biopsy on the 15th day revealed widespread necrosis and regeneration of muscle fibers. The patient's condition improved, and he was discharged 24 days after admittance. During the year following the incident the patient noted difficulty with recent memory, loss of libido and easy fatigability. One year after lindane ingestion, a physical examination, including tests for muscle power and bulk, were viewed as normal.

78-0074. Ballon, O. ; Havlickova, K. (Reg. Hyg. Stn., Hradec Kralove, Pardubice, Czechoslovakia) Hygienic problems **in the application of pesticides in the East Bohemian region.** *Cesk. Hyg.* 22(5): 200-204; 1977. (Czech)

Problems and safety methods involved in the application of DDT in the East Bohemian region of Czechoslovakia are discussed. In 1974 only 4% of agricultural workers were excluded from further work because of decreased cholinesterase activity, and DDT residues in cheese samples have declined. The amelioration of the DDT situation in this region is the result of efforts of the hygienic service to educate handlers of pesticides, to control the packaging and disposal of unused pesticides, and to regulate the use of pesticides.

78-0075. Anonymous **EDB facing tighter controls.** *Chem. Week* 121(23): 17; 1977.

Possible government restrictions facing the pesticide and gasoline additive ethylene dibromide are discussed. Stricted voluntary guidelines for industry control of worker exposure to EDB were issued by OSHA. Sterility and cancer links have been mentioned. The current 220 ppm standard for airborne concentrations of EDB in work areas has been challenged as too lenient by NIOSH. The suggestion was made to lower the limit to 0.13 ppm. Whole pesticide uses of EDB amounted to only 2-3 million per year in the United States currently, it is expected this use will climb, as the chemical can be readily substituted for DBCP, a pesticide which has come under fire. The government's possible EDB restrictions are being challenged by manufacturers and users, as are the data on which these restrictions are based.

78-0076. Schipper, I. A. ; Casper, H.; Johnson, D. (North Dakota State University, Fargo, ND) **Wood preservatives can be toxic to livestock.** *Crops Soils Mag.* 30(1): 26-27; 1977.

High levels of pentachlorophenol wood preservatives in dairy cattle may present a serious threat to all livestock. Levels of 15 to 1300 ppb in livers, 10 to 1136 ppb in blood, and 2 to 22 ppb in urine have been found, although corresponding levels in milk have not been detected. Previous studies on swine indicate a severe toxicity of penta. Acute poisoning will cause an accelerated breathing rate, and death may occur in 2 to 14 hours. Poisoning may occur due to ingestion or skin contact. Precautions such as removal of penta treated wood from feed storage areas and animal quarters are recommended.

78-0077. Jung, H.-D. ; Wolf, F. (Bezirksinspekt. Gesundheitssch. Betrieb. Neubrandenburg, DDR) **Kontaktekzeme**

durch das Herbizid Selest 100 in der Forstwirtschaft. [Contact eczema due to Selest 100 herbicide in forestry.] *Dtsch. Gesundheitswes.* 32(31): 1464-1467; 1977. (15 references) (German)

Five female forestry workers exposed to Selest 100 (mixture of 2,4-D and 2,4,5-T in diesel oil) developed toxic contact eczema. They were commissioned to apply this herbicide on trees using paint brushes, wearing rubber gloves and rubber boots. They developed severe eczema on the exposed parts of the skin (hands, arms, legs, and neck). The skin tests also revealed allergic reactions in two patients, and one also had a flare-up after renewed inhalative exposure. To prevent contact eczema, it is recommended that Selest 100 be distributed by means of a nozzle from a closed plastic tank, and rubber gloves and boots be replaced by those made of PVC.

78-0078. Spector, P. L. (No affiliation given) **Regulation of pesticides by the Environmental Protection Agency.** *Ecol. Law Quart.* 5(2): 233-263; 1976.

The Federal Environmental Pesticide Control Act (FEPCA) requires the Environmental Protection Agency (EPA) to balance risks and benefits in determining whether a pesticide should be allowed on the market. Four years elapsed between the first petition to remove aldrin and dieldrin from the market and their actual removal, due both to disagreement within the Environmental Protection Agency and the legal requirement that the EPA evaluate inconclusive evidence in making the decision. Establishing a maximum time limit on hearings, divided equally between proponents and opponents, would require the parties to present only their strongest arguments and eliminate some unnecessary delay. A more unified approach to regulation might be achieved by giving some prosecutor-like authority to the EPA's Office of General Counsel, rather than having it serve as legal adviser to the Office of Pesticide Programs as is done currently. Wider recognition that value judgments, rather than objective scientific facts, currently are the principal determinants of particular decisions involving pesticides would be desirable for two major reasons. Public and congressional awareness of this situation might lead to more pesticide research to narrow the area of uncertainty that makes discretionary value judgments unavoidable. This recognition would also focus attention on process-oriented concerns, with particular emphasis on the adjudicatory and rulemaking models and the allocation of decisionmaking responsibility within EPA.

78-0079. Motl, M. L. (No affiliation given) **EPA develops process to destroy kepone.** *Environ. Manage.* 1(6): 491-493; 1977. (3 references)

A process developed by the EPA for destruction of kepone (chlordecone) is reviewed. The process uses a special high temperature quartz tube apparatus with which the pesticide is first vaporized at a low temperature and then passed through the high temperature quartz tube at about 10000°C. The advantage of this approach is that thermal destruction data can be obtained with both temperature and residence time controlled and accurately measured. At these high temperatures the kepone is degraded into innocuous products. Development of a full scale unit to destroy kepone in this manner in the state of Virginia is expected to cost more than 4 million.

78-0080. Ember, L. (Affiliation not given) **OSHA on the move.** *Environ. Sci. Technol.* 11(13): 1142-1147; 1977.

This article summarizes recent changes in the structure and emphasis of OSHA, the Occupational Safety and Health Administration. The function of the administration when founded in 1970 was to protect the American worker from the hazards of the workplace. The recent appointment of Eula Bingham to the position of assistant secretary of OSHA and the reorganization which has occurred subsequent to that appointment are detailed. Emphasis is given to cooperative ventures between EPA and OSHA, as well as to close cooperation between NIOSH and OSHA. The right of workers to be informed of potential risks as well as coverage of job security and workmen's compensation are discussed. The establishment of reasonable and realistic standards is considered.

78-0081. Isman, W. E. (Dept. Fire and Rescue Services, Montgomery County, MD) **Could you handle a pesticide fire?** *Fire Eng.* 130(10): 36-38; 1977.

A fire in a large building storing common lawn fertilizers and insecticides (including carbaryl, malathion, dicofol, demethroate, Karathane, metasystox, lindane and methoxyclhor) presented serious problems to the fire fighting pesonnel in Montgomery County, Maryland. Toxic chemical fumes were inhaled by many people before the contents of the building were fully known. Symptoms and medical treatments were supplied by CHEMTREC, allowing removal and treatment of the victims. Water used for fighting the fire became contaminated with insecticides, and measures had to be taken to prevent it from entering the local water system. Suggestions are made for other fire fighting units to avoid similar problems. Preplanning in the form of knowledge of location and types of local chemical storage, establishment of contacts with local environmental agencies and poison experts, and practice of a routine for hazardous chemical fires is recommended.

78-0082. Coutselinis, A. ; Kentarchou, R.; Boukis, D. (Dept. Forensic Med. Toxicol., Univ. Athens, Sch. Med., Athens, Greece) **Concentration levels of 2,4-D and 2,4,5-T in forensic material.** *Forensic Sci.* 10(3):203-204; 1977. (4 references)

Blood and viscera from the body of a young woman who died after taking a large dose of Tributon 60 (contains 2,4-D and 2,4,5-T in a ratio of 3:2) were examined. She died 16 hours after taking the poison. This report if offered simply because of the data available on the concentration levels of these compounds in viscera in fatal cases is very slight. Concentration levels of the compounds are given for the blood, liver, kidney, and spleen.

78-0083. Weger, N. (Pharmakol. Inst. Univ., 8 Munich 2, Germany) **Antidote bei akuten Vergiftungen. [Antidotes in acute poisoning.]** *Fortschr Med.* 94(40): 2409-2412; 1977. (6 references) (German)

The antidotes to be applied in acute poisoning by various toxic substances are reviewed. The muscarinic effect of alkylphosphates, e.g., E 605 (parathion) can be reduced or suppressed by atropinization (first 5 mg in rapid injection, then 20 mg after the diagnosis is ascertained). The atropine dose to be given must be high enough to cause changes from miosis to mydriasis and from bradycardia to atropine-induced bradycardia. The nicotinic effects of alkylphosphates can be controlled by toxogonin (obidoxime) during the first 2 days after poisoning only. Enzyme reactivation with oximes does not obviate atropinization.

78-0084. Protecting bees during spraying. *Int. Pest Contr.* 4:3-4; 1977.

Most insecticides available for use on fields and crops are harmful to bees to some extent. To decrease the risk of harm to bees, several suggestions are made. Since bees tend to be attracted to crops in flower, the insecticides should be applied before or after this period if possible. The best time of day to apply insecticides is early morning or evening, avoiding the bees' active mid-day period. Cloudy days are also a good time to apply the insecticides. Granular pesticides are less harmful to bees than liquid forms. Disulfoton, phorate, pirimicarb, endosulfan, and phosalone are compounds that are less hazardous to the bees. The method of application should also be considered, since application of insecticides by air during mid-day is most harmful to the bees.

78-0085. Yoshida, K. ; Nagae, K. (Agric. Chem. Insp. Stn., Min. Agric. For., Kodaira, Tokyo, Japan) **[Agricultural pesticides which have failed to obtain reregistration in Japan due to the reevaluation of their safety since 1973.]** *Kongetsu No Noyaku (Agric. Chem. Mon.)* 21(12): 84-93; 1977. (Japanese)

According to the amendment to the Agricultural Chemicals Regulation Law of January 1971, even the already registered pesticides for agricultural use have come to be re-evaluated fom the viewpoints of toxicity and persistence when they are submitted for reregistration. The pesticidal active ingredients which failed in reregistration include 34 insecticidal compounds, 35 fungicidal compounds, 31 herbicidal compounds, 15 plant growth regulators and 2 rodenticidal compounds. There are some pesticidal compounds which were reregistered under restricted usage (target crops) and others which were reregistered only on non-edible crops. These three categories of pesticides were illustrated in three tables.

78-0086. Shield, L. K. ; Coleman, T. L.; Markesbery, W. R. (Dep. Neurol., Univ. Kentucky Coll. Med., Lexington, KY 40506) **Methyl bromide intoxication: neurologic features, including simulation of Reye syndrome.** *Neurology* 27(10): 959-962; 1977. (28 references)

A 6-yr-old boy, his 42-yr-old grandfather, and his 41-yr-old grandmother were hospitalized following exposure to a mixture of 98% methyl bromide and 2% chloropicrin. Exposure resulted from leakage of the insecticide from defective cannisters. The boy had an upper respiratory illness, of possible viral etiology, 24 hr preceding exposure to the insecticide. He developed an acute encephalopathy with fluctuating conscious state, hypotonia, areflexia, and extensor plantar responses. The occurrence of toxic encephalopathy and hepatomegaly initially led to a presumptive diagnosis of Reye syndrome, although subsequent liver function tests and a liver biopsy were not diagnostic of this syndrome. The onset of neurologic illness in the grandparents led to suspicion of a toxic etiology in the disorder. The boy showed complete recovery less than 2 mo after admission. The grandfather showed primarily mental disturbances, with only mild neurologic signs and no seizures. Initial euphoria and lack of concern progressed to a florid psychosis. His mental state was normal 6 mo later. The grandmother was severely affected and remained in status epilepticus for 7 days. The most prominent feature in this case was action myoclonus of probable subcortical origin; there was no observable intellectual impairment and the EEG showed only a generalized excess of 2-5 Hz activity. Severe anxiety and depression required psychiatric intervention. This case suggests that even severe status epilepticus following methyl bromide intoxication is compatible with recovery.

78-0087. Minowa, M. (Wajima Health Center, Ishikawa Prefecture, Wajima, Ishikawa, Japan) **[On a dermatitis seemingly attributable to a herbicide.]** *Nihon Koshu Eisei Zasshi (Jpn. J. Public Health)* 24(10): 616; 1977. (Japanese)

A high incidence of contact dermatitis during April-June, 1976 in Anamizu, Ishikawa Prefecture, was suspected to be due to *Cercaia* dermatitis or to a paddy field herbicide (X-52). The symptoms were redness and swelling of exposed skin of arms, peripheral parts, face and foreneck after paddy-field operation, followed by eruption (barley sized) with itching and a feeling of heat. After an epidemiological survey on 20 patients and 20 controls, it was presumed that the contact dermatitis was due to X-52 herbicidal granules (7% of chlomethoxynil, 2,4-dichlorophenyl 3′-methoxy- 4′-nitrophenyl ether) treated applied by workers with naked hands and arms without protective equipment.

78-0088. Chinen, M. ; Mori, T.; Anjirei, K.; Nakamura, Y.; Tamanaha, E.; Kiyamu, M.; Nakamoto, F. (Dept. Pediatr., Okinawa Prefect. Cent. Dist. Hosp., Okinawa, Japan) **[Six cases of intoxication due to thallium in a single district.]** *Nippon Shonika Gakkai Zasshi (Acta Pediatrica Jpn.)* 81(11): 1125-1126; 1977. (Japanese)

Six cases of thallium poisoning which occurred during June-October, 1976 in a single district were reported. The cases were divided into 2 groups, one in June and the other in October. The first group consisted of 3 cases, a four-year-old boy, another four-year-old boy and his three-year-old sister. The first case was suspected to be encephalitis, the second

was suspected to be a brain tumor (died after operation) and the third case was hospitalized for loss of hair and ataxia, which revealed that the intoxication was due to thallium. In urine of the first and third cases 0.14 and 0.6 ppm of thallium was detected. The second group consisted of 3 cases: a five-year-old boy, a five-year-old girl, her three-year-old sister, and a 4th case which presumably involved diabetic coma, but the childs urine contained 3.84 ppm of thallium. The urine contained 1.52 and 0.91 ppm of thallium in the 5th and 6th cases, respectively. In short, in boys, acute and subacute gastrointestinal symptoms and central nerval symptoms were conspicuously observed with severe course, and in girls, chronic loss of hair and ataxia were the major symptoms with a relatively favorable course. According to examination, abnormality of urine and EEG were indicated suggesting a strong attack on kidney and brain. Epidemiological investigation revealed that thallium sulfate solution (3%) had been used in homes in the district as a rodenticide.

78-0089. Upholt, W. M. (Environ. Prot. Ag., Washington, DC) **Pest control technology and the EPA: what is responsible regulation?** *Pest Control Technol.* 1(6): 484-489; 1977. (3 references)

This article reviews briefly the Federal Environmental Pesticide Control Act as it was passed in 1972. The purpose of the article is to discuss what constitutes responsible regulation in the area of pest control technology. Various factors which are considered in the paper include risk assessment, delayed affects, the use of scientific advice, effects on the environment, assessment of benefits from use of pesticides, administrative considerations to be understood, and the establishment of tolerances for residues in foods.

78-0090. Wiernikowski, A.; ; Wsolek, A. **Zaburzenia psychiczne w ostrych zatruciach pestycydami fosforoorganicznymi. [Psychological disturbances in acute poisoning with organic phosphorus pesticides.]** *Polski Tygodnik Lekarski* 32(40): 1565-1567; 1977. (23 references) (Polish)

Fifty-six cases of organic phosphorus poisoning from the years 1967 to 1975 are reviewed. In 9/56 cases, psychotic disturbances with delirius syndrome were observed; 2 cases of depressive psychoses, and 1 case of organic psychosis were also observed. These numbers demonstrate the need for inpatient and outpatient psychiatric care of patients suffering from acute organophosphorus toxicity.

78-0091. Infante, P. F. (Div. Surveillance, Hazard Evaluations and Field Studies, NIOSH) **Blood dyscrasias and childhood tumors and exposure to chlorinated hydrocarbon pesticides.** *Proceedings of a Conference on Women and the Workplace June 17-19* 51-74; 1976. (63 references)

Blood dyscrasias and childhood tumors linked to exposures to chlorinated hydrocarbon pesticides are reviewed. New cases of blood dyscrasias and childhood tumors are reported following exposure to chlordane. Cases presented of aplastic anemia are consistent with previous literature on associations between chlordane, similar chlorinated hydrocarbons and blood dyscrasias. An association between chlordane exposure and leukemia is suggested in view of previous reports indicating that subjects with aplastic anemia convert to leukemia. In view of recent data on the carcinogenicity and mutagenicity of chlordane and heptachlor and in view of data on environmental distribution and body burdens, cases suggesting association between chlordane exposure and neuroblastoma are of interest. Valid inferences regarding the neoplastic risk of chlordane are not possible on the evidence available. Epidemiological studies to evaluate the short and long-term health risks associated with chlordane in home use and in occupational use for the agricultural setting, for termite exterminators and for lawn care operators are needed.

See also 78-0057 78-0060 78-0061 78-0091 78-0207 78-0217 78-0229

78-0092. Balicka, N. ; Krezel, Z. (Dept. Microbiol., Agric. Acad., Wroclaw, Poland) **Effect of microorganisms on phytotoxicity of herbicides: interaction of some microorganisms with betanal.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 57; 1977.

The effect of microbial action of Betanal (phenmedipham) activity was investigated using mustard as the test plant. Mustard seeds were saturated with a bacterial culture, and after the seedlings had emerged they were sprayed with 10-100 ppm Betanal solutions. Twelve of 200 microbial strains examined were selected displaying the ability to modify Betanal. Ten of these strains reduced the effect of Betanal, whereas two strains increased it. These bacterial strains alone inhibited growth of the test plants, presumably by producing toxic polysaccharide compounds. It was uncertain whether the observed reduction of Betanal effect by microbes was due to Betanal decomposition, as originally assumed.

78-0093. Nehez, M. ; Paldy, M. D. A.; Salypes, A. (Inst. Publ. Health Epidemiol., Univ. Med. Sch., Szeged, Hungary) **Decomposition of the dinitro-*o*-cresol by microorganisms.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 57-58; 1977.

The decomposition of dinitro-o-cresol (DNOC), the active ingredient of Krezonit E, by bacteria was investigated to give some idea of the speed of its decomposition under environmental conditions. *Escherichia coli, Proteus vulgaris, Bacillus cereus,* and *Bacillus subtilis* all affected DNOC composition, especially at their optimum growth temperature of 37°C. The changes in DNOC toxicity caused by this metabolic transformation were investigated by injecting the DNOC solutions intraperitoneally into white mice and determining the LD50 before and after microbiological decomposition. Toxic metabolites were not detected.

78-0094. Krezel, Z. ; Leszczynska, D. (Dep. Microbiol., Agric. Acad. Wroclaw, Poland) **Effect of herbicides on antibiotic activity of bacterial strains isolated from cucumber phyllosphere.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 59; 1977.

The antibiotic activity of 250 strains of saprophytic bacteria was examined against four strains of phytopathogenic bacteria comprising two strains of *Pseudomonas lachrymans* and two strains *Erwinia carotovora*. Antibiotic activity against *E. carotovora* was displayed by 15% of the test strains and against *P. lachrymans* by 10%. A strain isolated in plant tests and identified as *Bacillus subtilis* displayed strong antibiotic action against the phytopathogens. Micropot experiments were performed in which treatment with a supernatant of the isolated *B. subtilis* strain was followed by infection with the phytopathogenic bacteria. The herbicides Venzar (lenacil) and CIPC (chlorpropham) modified the antibiotic action of the *B. subtilis* to some extent; the activity of this strain was higher in the presence of 50 ppm CIPC.

78-0095. Dobolyi, C. ; Pasztor, Zs.; Kecskes, M. (Natl. Inst. Hyg., Budapest, Hungary) **Species diversity and quantity of microscopic fungi influenced by herbicide interactions in chernozem ecosystems.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 59-60; 1977.

The fungal counts in chernozem ecosystems with forest residues were altered by addition of 2,4-D at 0.01 and 0.1%, to a degree that varied with the medium used. High doses (1%) of 2,4-D had a marked depressive effect (70%). Commercial 2,4-D preparations (Dikonirt) were twice as toxic to soil fungi as chemically pure 2,4-D; their toxicity was further enhanced by the presence of 0.1% atrazine. The species distribution of the fungi was also markedly changed. One *Fusarium* sp. was present at five times control levels following addition of 1% 2,4-D and eight times when 0.1% atrazine was also added.

78-0096. Sobieszczanski, J. ; Stempniewicz, R.; Maniara, G. (Agric. Univ. Inst. Food Sci. Technol., Wroclaw, Poland) **Soil microorganisms and herbicide metabolism.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 60; 1977.

Soil microorganisms play a major role in the fate of pesticides in soil. Plants in degraded black soil, sand or claysand were treated annually for many years with high doses of triazine or urea compounds. Soil samples were examined by microbiological, thin layer chromatographic, column chromatographic, and gas chromatographic methods. Soil persistence of herbicides is primarily determined by the chemical structure of the herbicide.

78-0097. Toth, B. (Univ. Agric. Sci., Keszthely, Hungary) **Effect of a few herbicides on the microbiological decomposition of corn-stalk.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 60; 1977.

The carbon dioxide releasing capacity of brown forest soil collected near Keszthely was measured in a laboratory. The soil was amended with cornstalks, and various doses of the herbicides and chemical fertilizers (propachlor), Adtikon, Afalon (linuron), and Hungarian K-64. The herbicides considerably inhibited CO_2 production when applied at 100-400 times the usual concentrations. The inhibitory effect was considerably reduced by adding an adequate dose of nutritive material supplement. Hungarian K-64 and Adtikon stimulated the CO_2 production of soil in the first 12-14 wk of the 20-week experiment. Ramrod and Afalon had no appreciable effect on the quantity of CO_2 produced by the decomposing corn stalks.

78-0098. Cserhati, T. ; Kecskes, M. (Res. Inst. Plant Prot., Res. Inst. Soil Sci. Agric. Chem., Hungarian Acad. Sci., Budapest, Hungary) **Interactions of linuron and soil microorganisms.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 61-62; 1977.

The decomposition of linuron was examined when added to sterilized or intact chernozem soil with forest residues at 10, 18, 26, or 37°C. Microbial decomposition was not essential for linuron degradation in soil. The activation energy for chemical decomposition was 19.4 kcal/mol, and for microbial decomposition 13.3 kcal/mol. The degradation

rate constants measured in sterilized soil and in aqueous buffer solution of the same pH were similar. Linuron (5 ppm) decomposition and changes in total microbial counts were examined in the chernozem and brown forest soils at 26°C in the presence of various insecticides, fungicides, and herbicides. The decomposition rate of linuron was markedly decreased by 30 ppm of lindane, diazinon, lindane plus thiram, and Falisan, a fungicide with a 2.5% mercury constant, especially during the first week after addition to the soils. Propachlor, simazine, methoprotryne, and prometryne at 5 ppm did not affect linuron decomposition. The linuron decomposition rate was not closely correlated with the total microbial count.

78-0099. Helmeczi, B. (Soil Sci. Microbiol. Dep. Univ. Agric. Sci., Debrecen, Hungary) **Effect of herbicides on quantitative changes of soil bacteria.** *Acta Microbiol. Acad. Sci. Hung.* 24(1): 62-63; 1977.

Bacterial counts were taken by Pochon's method on chernozem soil samples collected in spring, summer, and autumn from small field plots in a latin block arrangement. Test plots were treated with single or combination herbicides including linuron, EPTC, propachlor, butylate, and terbutryn. Separate counts were performed on aerobic nitrogen-fixing, aerobic cellulose decomposing, ammonifying, and nitrifying soil bacteria. The nitrifying bacteria were the most sensitive to herbicides. The inhibitory effect ranged from 5 to 32% in 1974 and 14 to 40% in 1975. Aerobic cellulose decomposing bacteria were least sensitive.

78-0100. Suzuki, T. (Dep. Pub. Health, Tohoku Univ. Sch. Med., Sendai, Japan) **Metabolism of mercurial compounds.** *Adv. Mod. Toxicol.* 2: 1-39; 1977. (252 references)

Recent literature dealing with the metabolism of mercury compounds is reviewed. The pulmonary absorption of mercury compounds depends primarily on the volatility, solubility, and particle size of the compound, and the efficiency of gastrointestinal absorption depends on the dose, the form of the compound, and the influence of coexistent substances in food. Topical application of mercurials may also result in serious intoxication, although it us unknown whether the transdermal or follicular pathways of skin absorption are more important. The mercury of various chemical forms is transported by binding to plasma protein or blood cells, except in the case of mercury vapor exposure where the rate of oxidation is not fast enough to prevent some of the elemental mercury from reaching the brain. The placental transfer of mercurials is dependent on the form of the compound and may be influenced by species differences in placental structure and function and by differences in the hematocrit and binding characteristics of the hemoglobins of the fetus and adult. The biotransformation of the different mercury compounds is discussed in detail, as is secretion of these compounds in the bile, urine, and milk. The distribution, accumulation, and toxicity of mercurials are discussed in relation to their metabolic properties.

78-0101. Fowler, B. A. (Environ. Toxicol. Br., Natl. Inst. Environ. Health Sci., Research Triangle Park, NC) **Toxicology of environmental arsenic.** *Adv. Mod. Toxicol.* 2: 79-122; 1977. (234 references)

The toxicology of arsenic is reviewed from an overall environmental perspective. Arsenic may be inhaled or ingested in drinking water or food. Fish and shellfish concentrate arsenic, which appears to be organically bound in the tissues and may be rapidly excreted following ingestion depending on whether the tissues have been cooked or processed. Arsenicals have also been used as feed additives for poultry and livestock, and crops sprayed or grown in soil treated with arsenicals may incorporate arsenic. Binding of arsenic by the blood shows species variation. An absorbed dose of arsenic is distributed to the kidney, liver, spleen, skin, hair, and nails in that order, and some arsenic may remain in these tissues long after it has disappeared from the blood, urine, and feces. In humans, a single dose of arsenic is excreted rapidly within the first few days and more slowly during the succeeding 2 wk. Acute arsenic poisoning following ingestion of the toxicant by animals and humans is characterized by gastrointestinal damage, convulsions, and hemorrhage. Fatty degeneration of the liver and kidneys is common and peripheral neuropathy may be observed. Acute inhalation of arsine gas is followed by extensive hemolysis, hemoglobinuria, and death from renal failure. Anorexia, anemia, and disturbances in renal, hepatic, and neurological function may occur following more chronic intoxication. The cellular toxicity of arsenic is usually attributed to the inhibition of cellular respiration. Trivalent arsenicals inhibit the pyruvate oxidase system, leading to the accumulation of pyruvate in the blood and urine. Pentavalent arsenic may substitute for phosphate during oxidative phosphorylation, leading to the formation of arsenate esters and decreased oxidative phosphorylation. Arsenic must be regarded as an important environmental toxicant.

78-0102. Nakamura, Y. ; Ishikawa, K.; Kuwatsuka, S. (Lab. Soil Sci., Fac. Agric., Nagoya Univ., Japan) **Metabolic fate of benthiocarb herbicide in plants.** *Agric. Biol. Chem.* 41(9): 1613-1620; 1977. (15 references)

The metabolic rate of C-14 labeled benthiocarb was studied in rice plant and barnyard millet at the 4-leaf stage. The purpose behind the study was to gain a further understanding of the mechanism of the herbicidal activity and selective toxicity of this compound and to know degradation products which may possibly transfer from crops to man and livestock. Benthiocarb was rapidly degraded after absorption through the root. Most radioactivity was extracted with aqueous acetone. Desethyl benthiocarb, *S*-4-chlorobenzyl thiocarbamate, 4-chlorobenzoic acid, 2-hydroxybenthiocarb, desethyl 2-hydroxybenthiocarb, 4-chloro -2- hydroxybenzyl alcohol and 4-chlorosalicylic acid were metabolic products. These metabolic products were found in both the root and foilage of the plants. There was little difference in the metabolic pattern of the two plants. (Author abstract by permission.)

78-0103. Touitou, Y. ; Bogdan, A.; Legrand, J. C.; Desgrez, P. (Service de Biochimie, Faculte de Medecine Pitie-

Salpetriere, F 75634 Paris Cedex 13, France) **Metabolisme de l'*o,p'*-DDD (mitotane) chez l'homme et l'animal. Donnees actuelles et deductions pratiques. [Metabolism of *o,p'*-DDD (mitotane) in humans and animals. Current concepts and practical deductions.]** *Ann. Endocrinol. (Paris)* 38: 13-25; 1977. (57 references) (French)

The metabolism of *o,p'*-DDD (mitotane), a well known inhibitor of adrenal steroid pathways in man and animals, is reviewed. Experiments with oral dosing of mitotane indicate that approximately 65% of the ingested drug is excreted with the stool. Mitotane metabolites, *o,p'*-DDA and its mono- and dihydroxylated derivatives appeared in the urine as well as in the stools. An unsaturated metabolite, *o, p'*-DDE, was observed in the plasma and tissuespof man. Serum DDD levels of patients undergoing treatment with mitotane for adrenal cortical carcinoma were very variable (5-90 μg/ml), as was the rate of change of serum level. Biopsy and autopsy specimens from man and animals indicate that mitotane is stored primarily in fat tissue. This review suggests that there is no correlation between amount of *o,p'*-DDD ingested and blood levels, or between blood levels of *o,p'* -DDD and responsiveness to treatment.

78-0104. Khan, H. M. ; Khan, M. A. Q. (Dept. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680) **Biological magnification of photodieldrin by food chain organisms.** *Arch. Environ. Contam. Toxicol.* 2(4): 289-301; 1974. (20 references)

Species differences were seen among fresh-water invertebrates and fishes in the absorption and subsequent retention of photodieldrin (a sunlight conversion product of the insecticide, dieldrin). The crayfish *Cambarus* and the clam *Simpsoniconcha* showed extremely low levels of absorption and accumulation while the larvae of the mosquiteo *Aedes*, the amphipod *Gammarus*, and the cladocerans *Simocephalus* , and fresh-water flea *Daphnia* showed much higher levels of this insecticide. Maximum absorption occurred within 12 to 24 hours of exposure in only a few invertebrates but in most fishes. Among fishes, five to six times higher levels were seen during this period in guppy and goldfish than in minnow and bluegill. While the livebearer, guppy, kept absorbing photodieldrin with time, other fishes showed a slight decline in their tissue levels of this insecticide. The maximum biological magnification ratios during peak periods of absorption were: 133 for bluegill, 150 for minnow, 609 for goldfish, and 820 for guppy. Among microcrustacea the maximum biological magnification ratios seen after four days of continuous exposure were about 1000 for *Simocephalus*, 1200 for *Gammarus*, and 63,000 for *Daphnia*. No appreciable in vivo metabolism of photodieldrin was seen in fishes, minnow and bluegill, and the decline in their body levels of photodieldrin is apparently not due to detoxication of the latter. (Author abstract by permission.)

78-0105. Reuber, M. D. (Chem. Carcinogenesis Program, NCI Frederick Cancer Res. Cent., Frederick, MD 21701) **Hepatic vein thrombosis in mice ingesting chlorinated hydrocarbons.** *Arch. Toxicol.* 38(3): 163-168; 1977. (20 references)

Hepatic vein thrombosis was studied in mice ingesting chlorinated hydrocarbons. C3H male and female mice were fed 10 ppm dieldrin, aldrin, heptachlor, or heptachlor epoxide in their diets to induce hepatic vein thrombosis as well as hepatocellular carcinomas. Thrombosis was noted in 5% of the mice ingesting dieldrin or aldrin and in 10.5% of those ingesting heptachlor or heptachlor epoxide. Infarcts of the liver resulted from occlusion of the hepatic vein. Females ingesting heptachlor or heptachlor epoxide were slightly more susceptible than were males. There was no difference between male and female mice ingesting dieldrin or aldrin. Hepatic vein thrombosis did not appear to be related to the development of carcinoma of the liver as it was present in livers without carcinomas as well. Thrombosis was usually seen only in the liver but also rarely was present in the atria of the heart. (Author abstract reprinted by permission.)

78-0106. Mendoza, C. E. ; Collins, B.; Shields, J. B.; Laver, G. W. (Chem. Safety Bureau, Food Directorate, Health Protection Branch, Natl. Health and Welfare, Ottawa, Canada) **Hexachlorobenzene residues and effects of esterase activities in pre-weanling rats after a reciprocal transfer between HCB-treated and control dams.** *Arch. Toxicol.* 38(3): 191-199; 1977. (30 references)

Hexachlorobenzene (HCB) residues and effects on esterase activities were studied in pre-weanling rats after a reciprocal transfer between HCB-treated and control dams. The treated group received ad libitum powdered rat chow containing 80 ppm HCB for 2 weeks before mating until the end of the experiment. Liver esterase activity toward indophenyl, thiophenyl and *p*-nitrophenyl acetates were determined in the pups. The liver to body weight ratio, liver esterase activity and HCB residues were significantly higher in pups nursed by HCB-fed dams than in those nursed by controls. The HCB residues in the liver, kidney, spleen, heart and brain were analyzed by gas-liquid chromatography. At about the weaning time, the HCB levels in pups transferred after parturition from HCB fed to control dams were similar to those in pups which remained with the controls. The results of the study demonstrated that HCB in tissues at about the weanling time was obtained largely through milk. In addition, transmission of HCB through milk had greater effects on esterase activities in suckling pups than did placental transmission. The pups born to HCB-treated dams and nursed by the controls were similar to the pups born and nursed by the same controls. (Author abstract reprinted by permission.)

78-0107. Hettwer, H. ; Gericke, C. (Anat. Inst., Lehrstuhl II., Univ. Dusseldorf, Dusselforf, Germany) **Lipide der Plasmamambranen und der Mitochondrien aus Rattenleber nach Paraoxon-Intoxikation. [Lipids of plasma membranes and of mitochondria in rat liver after intoxication with paraoxon.]** *Arch. Toxicol.* 38(4): 251-260; 1977. (46 references) (German)

0.426 mg/kg Paraoxon was administered to female Sprague-Dawley rats. 4, 10 and 24 hr after poisoning, choles-

terol, glyceride and phospholipid content was measured in liver plasma membranes and mitochondria. After 4 hr cholesterol content of plasma membranes was significantly lower. Phospholipid content of plasma membranes was significantly higher than control values at all times of investigation; contents of neutral lipids and glycerides were also higher, but not significantly. In mitochondria, no significant difference of cholesterol content could be detected. Glyceride content was lower after 4 and 10 hr, but phospholipid content higher at all experimental times. Differences found in cholesterol and phospholipid content of plasma membranes are also discussed in view of higher serum GOT, GPT and CPK activities known from other investigations. The differences in cholesterol and phospholipid content, their degree and their timing, which agrees with the timing of enzyme leakage, suggest that lipid composition of the plasma membrane may be one of the parameters which determine membrane permeability after organophosphate poisoning. (Author abstract by permission)

78-0108. Matthiaschk, G. ; Roll, R. (Max von Pettenkofer Inst., Bundesgesundheitsant, D-1000 Berlin 33, Germany) **Untersuchungen uber die Embryotoxicitat von Monolinuron und Buturon bei NMRI-Maeusen. [Studies on the embryotoxicity of monolinuron and buturon in NMRI-mice.]** *Arch Toxicol.* 38(4): 261-274; 1977. (4 references) (German)

The acute LD50 in virginal NMRI-mice was found to be 2528 mg/kg for monolinuron and 1791 mg/kg for buturon. Pregnant female mice of the NMRI strain were administered orally 25-1000 mg monolinuron/kg (I) and 100-400 mg buturon/kg (II) on days 6-15 of gestation and, during defined phases of fetal development (days 10-13 after conception), 500 mg I/kg and 350 mg II/k. Following administration of 10 doses, an increase of postimplantative losses and clear retardation of development in the upper dose range from 100 mg I/kg and 300 mg II/kg as well as a dose-dependent increase of the rate of cleft palates could be observed. High doses of both substances given from day 6-15 of pregnancy produced minor numbers of wavy and fused ribs as well as hypoplasia of the upper jaw after application of monolinuron and exenteria and exencephaly after buturon. Administration of monolinuron between days 10 and 13 of gestation resulted in a minor and that of buturon a clear increase of the number of cleft palates. To evaluate postnatal development 200 and 500 mg I/kg, and 200 and 300 mg II/kg were administered orally on days 6-15 of gestation. In the higher doses, both substances produced an increased mortality among the offspring up to 3 weeks after birth, and a clear increase of the rate of cleft palates. (Author abstract by permission.)

78-0109. Moscioni, A. D. ; Engel, J. L.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dept. Entomol. Sci., Univ. California, Berkley, CA 94720) **Kynurenine formamidase inhibition as a possible mechanism for certain teratogenic effects of organophosphorus and methylcarbamate insecticides in chicken embryos.** *Biochem. Pharmacol.* 26(23): 2251-2258; 1977. (22 references)

At least two types of developmental anomalies are induced in chicken embryos by certain organophosphorus (OP) and methylcarbamate (MC) insecticides. One of them (Type I) leads to micromelia and abnormal feathering and another (Type II) involves arthrogryposis, wry neck and rumplessness. Type I but not type II teratogenesis is associated with a lowered embryo NAD level and is alleviated on restoring the NAD level by administration of intermediates in the tryptophan to NAD biosynthetic pathway. These and other observations with chicken embryos suggest but do not in themselves establish that impairment in the conversion of tryptophan to NAD, possibly by inhibition of kynurenine formamidase, leads to type I teratogenesis. This hypothesis is supported by finding that mouse liver kynurenine formamidase is extremely sensitive to in vivo inhibition by those OP and MC compounds which are the most potent NAD lowering agents and teratogens in the chicken embryo, i.e. crotor amide phosphates and pyrimidyl phosphorothionates such as dicrotophos and diazinon and MC compounds such as carbaryl. Teratological or other toxicological manifestations of kynurenine formamidase inhibition are probably restricted to species and developmental stages where reduced enzyme activity significantly impairs maintenance of normal levels of NAD or other essential biochemicals derived from kynurenine. (Author abstract by permission.)

78-0110. Tong, S. ; Ioannides, C.; Parke, D. V. (Dept. Biochem., Univ. Surrey, Guildford, Surrey GU2 5XH, England) **Enhancement of 2-hydroxylation in vitro of biphenyl by organochlorine insecticides.** *Biochem. Soc. Trans.* 5(5): 1374-1377; 1977. (14 references)

Organochlorine insecticides accumulate in the body fats of man and animals. The extent of the carcinogenicity of these substances is widely debated. The biphenyl test was used to evaluate the carcinogenic potential of DDT and its metabolic products, DDD and DDE. Male Wistar albino rats, male CF-1 6-week-old mice, and adult polecat ferrets were analyzed in the study. After the animals were killed, the activities of both biphenyl 2- and 4-hydroxylase were determined in microsomal suspensions. Both DDT and DDD enhanced the 2-hydroxylation of biphenyl in microsomal fractions from the three species. The enhancement was concentration dependent. The DDE had no effect or decreased the activity. The biphenyl 4-hydroxylase activity remained unchanged or decreased. The DDE and the DDT-DDD are acted on by different enzyme systems, resulting in different metabolites. This difference may be the reason that DDF and DDD result in activation of the biphenyl 2-hydroxylase system and their potential for carcinogenesis.

78-0111. Beliaeva, N. N. ; Bonashevskaia, T. I.; Marshak, T. L.; Brodskiy, V. Ya. (Lab. Morphol., A. N. Sysin Inst. Gen. Commun. Hyg., Moscow, USSR.) **Issledovanie vliyaniya ryada veshchestv iz gruppy khlorproizvodnykh uglevodorodov na sostav populiatsii gepatotsitov pecheni krys. [Investigation of the effect of certain compounds from the organochlorine group on the composition of the hepato-**

cyte population in rats.] *Byull. Eksp. Biol. Med.* 83(3): 345-348; 1977. (13 references) (Russian)

The effects of inhaled dichloropropane (DCP) and trichloropropane (TCP) on the ploidy of hepatocyte nuclei were studied cytophotometrically and karyometrically. The animals inhaled DCP (0.0045-2.2 mg/l) or TCP (0.002-2.16 mg/l) for 1-90 days. Significant increase was observed in the number of mononucleate hyperploidic hepatocytes (8n and 16n) in animals exposed to 2.16 mg/l DCP and those exposed to 0.8 mg/l TCP. The change observed in the polyploidization was different in rats exposed to 1.1 mg/l DCP, which indicates that the toxicity is dependent on the chemical structure of the organochlorine compounds. The changes of the ploidy were proportional to the product of the concentration times the length of exposure.

78-0112. Chekman, I. S. ; Natsyuk, M. V. (Kiev Med. Inst., Kiev, USSR) **Vliyanie dipiroksima na soderzhanie nikotinamidnykh kofermentov i adenilovykh nukleohdov v miokardie i pecheni krys, otravlennykh ftalafosom. [The influence of dipyroxime on the content of nicotinamide coenzymes and adenylic nucleotides in the myocardium and liver** of rats poisoned with phthalophos.] *Byull. Eksp. Biol. Med.* 84(11): 577-579; 1977. (13 references) (Russian)

The influence of dipyroxime on the content of nicotinamide coenzymes and adenylic nucleotides in the myocardium and liver of rats poisoned with phthalophos was studied. The concentration of 68.8% phthalophos decreased the myocardial nicotinamide coenzymes content due to a reduction in the amount of the oxidized forms. In the liver phthalophos diminished the content of oxidized and reduced forms of nicotinamide coenzymes, decreasing the level of adenylic nucleotides chiefly at the expense of ATP. Dipyroxime prevented the changes caused by phthalophos in blood cholinesterase reactivation to the extent of 47.5%. It is suggested that the capacity of dipyroxime to normalize the oxidative processes in the cell by acting on the nicotinamide coenzymes and adenylic nucleotides underlies its antidote action.

78-0113. Lee, M. J. ; Waters, H. C. (Technicon Sci. Cen., Tarrytown, NY) **Inhibition of monocyte esterase activity by organophosphate insecticides.** *Blood* 50(5): 947-951; 1977. (12 references)

The Hemalog D system (Technicon Corp.) was used to measure the in vitro inhibition of human monocyte esterase activity by organophosphate insecticides. Fifty percent inhibition of esterase activity occurred at pesticide concentrations of 0.22, 1.5, and 2.6 μg/l for dichlorvos, tetrachlorvinphos, and naled, respectively; and at 37 μg/l for parathion, and 140 μg/l for baygon (propoxur). Chlorpyrifos and Carbaryl showed marginal inhibition, and eserine, malathion, nicotine, and pyrethrum had no inhibitory effect up to 0.5 g/l. These experiments have demonstrated the effect of dichlorvos on human monocyte esterase activity. Further experimentation is required to characterize the long term in vivo effects of dichlorvos.

78-0114. Hattula, M. L. ; Elo, H.; Sorvari, T. E.; Reunanen, H.; Arstila, A. U. (Dep. Chem., Univ. Jyvaskyla, Jyvaskyla, Finland) **Acute and subchronic toxicity of 2-methyl -4-chlorophenoxyacetic acid (MCPA) in male rats. I. Light microscopy and tissue concentrations of MCPA.** *Bull. Environ. Contam. Toxicol.* 18(2): 152-158; 1977. (8 references)

Male Sprague-Dawley rats were given single sc injections of the sodium salt of MCPA (0-700 mg/kg) or were given MCPA (100-3,000 mg/l) in their drinking water over a 9-wk period. The animals were killed immediately after treatment and the tissues were analyzed by gas chromatography. The LD50 sc for MCPA was 500 mg/kg, and all dose levels causing myotonia and diarrhea. Consumption of MCPA in the drinking water was associated with decreased water consumption, delayed weight gain, and increases in the relative weights of the liver, brain, kidneys, and adrenals; most of these changes were seen primarily at MCPA doses of 1,000 mg/l or higher. After both methods of administration, MCPA produced parenchymal cell degeneration and moderate and unspecific hyperemia in the liver, and disappearance of the white pulp with marked lymphocyte depletion in the spleen. The histological changes in the spleen were more marked after sc administration. The data indicate that MCPA is not highly toxic to rats.

78-0115. Krause, W. (Dep. Androl., Ctr. Dermatol., Fac. Med., Justus Liebig-Univ., Giessen, Germany) **Influence of DDT, DDVP and malathion on FSH, LH and testosterone serum levels and testosterone concentration in testis.** *Bull. Environ. Contam. Toxicol.* 18(2): 231-242; 1977. (8 references)

Adult male Wistar rats were treated orally with DDVP (dichlorvos, 10 mg/kg every second day for 2 wk or 5 mg/kg three times weekly for 3 wk), DDT (200 mg/kg every second day for 2 wk or 100 mg/kg three times weekly for 3 wk), malathion (20 mg/kg every second day for 2 wk), or the vehicle alone (three times weekly for 3 wk). The animals were sacrificed at the end of the treatment period. None of the treatments had any significant effects on body, testis, or seminal vesicle weight. Malathion significantly increased the FSH levels in the serum but had no effects on the serum LH or testosterone levels. DDT significantly reduced the testosterone levels in the serum and testes, but had no effects on the serum FSH and LH levels or on the histology of the spermatogenetic epithelium of the testes. DDVP had no significant effects on any of the parameters studied. The data suggest that the previously observed effects of DDT on spermatogenesis are mediated by a reduction in androgen levels, whereas the effects of DDVP and malathion on spermatogenesis are due to a direct cytotoxicity.

78-0116. Rand, G. M. (Dep. Biol., Texas A & M Univ., College Station, TX 77843) **The effect of exposure to a subacute concentration of parathion on the general locomotor behavior of the goldfish.** *Bull. Environ. Contam. Toxicol.* 18(2): 259-266; 1977. (20 references)

Goldfish (*Carassius auratus*) were exposed to suba-

cute concentrations of parathion (0.33 ppm) under stagnant conditions for 24 hr periods. The locomotor behavior of the fish was monitored for 8 hr before and 24 hr after pesticide exposure. The data demonstrated an overall decline in activity, as measured by a decrease in total number of entries into compartments and an increase in the average duration of all pathways, after exposure to parathion. During the 24 hr period of exposure to parathion, the fish remained listless on the bottom of the holding tank. Parathion exposure also resulted in a change in orientation angle distribution in some fish. Whereas untreated controls displayed a pattern which was characterized by a preponderance of small angles, the distribution after parathion was often distinguished by a shift in magnitude to larger angles. This suggests that parathion exposure may affect motor control mechanisms, and that a large number of other behaviors involving locomotion may also be affected.

78-0117. McCorkle, F. M. ; Chambers, J. E.; Yarbrough, J. D. (Dep. Zool., Mississippi State Univ., Mississippi State, MS 39762) Acute toxicities of selected herbicides to fingerling channel catfish, *Ictalurus punctatus*. *Bull. Environ. Contam. Toxicol.* 18(3): 267-270; 1977. (7 references)

One-year-old catfish (*Ictalurus punctatus*) fingerlings were exposed to 1 and 10 ppm concentrations of the following herbicides for 48-hr periods: alanap, bensulide, chloramben, 2,4-D acid, 2,4-D dimethyl amine salt, dalapon, diuron, DNBP, DSMA, EPTC, fluometuron, metribuzin, monuron, MSMA, nitralin, propanil, 2,4,5-T trifluralin, and Dyanap mixture. Of these, only bensulide, DNBP, propanil, and trifluralin caused greater than 10% motality at the highest concentration. The 96-hr LC50 values for the four most toxic herbicides were: 3796 ppb for propanil; 417 ppb for trifluralin; 379 ppb for bensulide; and 118 ppb for DNBP. The toxicity of Dyanap, a mixture of DNBP and alanap, was lower than that of DNBP; there was no apparent toxicities of propanil, trifluralin, bensulide, and DNBP were compared with that of endrin, and the four herbicides appeared not to be extremely toxic, although they do represent a potential hazard to catfish. The other herbicides tested appear safe for controlled use near catfish ponds.

78-0118. Villeneuve, D. C. ; Yagminas, A. P.; Marino, I. A.; Chu, I.; Reynolds, L. M. (Biochem. Toxicol. Section, Environ. Health Directorate, Health Protection Br., Ottawa, Canada) **Effects of food deprivation in rats previously exposed to mirex.** *Bull. Environ. Contam. Toxicol.* 18(3): 278-284; 1977. (8 references)

Mirex in corn oil was administered by gavage to male Sprague-Dawley rats at dosages of 0-10 mg/kg for 14 days. After treatment, some of the animals had their food intake reduced to 25% of control levels for 8 days. Tissue mirex concentrations were determined by electron capture gas chromatography. Body weight and food intake were significantly reduced in animals given 10 mg/kg mirex, and liver weight was increased in rats given 1.0-10 mg/kg mirex. Mirex had no effect on any of the hematological parameters monitored. Lactic dehydrogenase and microsomal enzyme activities were increased by mirex at all dose levels, and sorbitol dehydrogenase activity and liver protein levels were increased by mirex at 10 mg/kg. Liver protein levels were also increased in animals given 1.0 mg/kg mirex, then subjected to food deprivation. In general, the mirex levels in all tissues except fat were lower immediately after mirex treatment than after 8 days of normal food intake without mirex. Mirex levels were higher in all tissues after food deprivation than after normal food intake. The rate of excretion of mirex was unaffected by food deprivation. Mirex administration increased fatty infiltration in the centrilobular region of the liver in a dose-dependent fashion; this was not affected by food deprivation. The results indicate that food deprivation causes a relocation of mirex residues due to mobilization of fat depots but that it does not significantly alter the toxicity of mirex.

78-0119. Chiba, M. (Res. Station, Agr. Canada, Vineland Station, Ontario, Canada) **Effects of temperature on the equilibrium of benomyl, and its degradation products methyl 2-benzimidazole carbamate and *n*-butyl isocyanate in benzene and chloroform.** *Bull. Environ. Contam. Toxicol.* 18(3): 285-290; 1977. (3 references)

The effect of temperature on the rate of degradation of benomyl and its equilibrium concentration in benzene and chloroform was studied. A smaller proportion of benomyl remained in both solvents after high speed blending than after gentle shaking, the effect being more pronounced in chloroform than in benzene. However, when the temperature during blending was maintained at the same level as during shaking, the rate of degradation was the same for both types of agitation. The proportion of benomyl remaining intact over the temperature range of 25-60°C was higher in benzene than in chloroform, and for both solvents the proportion of benomyl in the system decreased significantly as the temperature increased. The data indicate that a large percentage of benomyl in either solvent is degraded during blending because of the heat generated. Thus, it is essential to maintain a constant low temperature during extraction if individual concentrations of intact benomyl and its metabolite methyl 2-benzimidazole carbamate (carbendazim) are to be determined rather than the total of the two.

78-0120. Bauman, T. R. ; Smitherman, D. K. (Dept. Biol., Univ. Alabama, University, AL 35486) **The effect of exogenous administration of thyroxine on the accumulation of *o,p'*-DDT in rat abdominal fat.** *Bull. Environ. Contam. Toxicol.* 18(3): 322-325; 1977. (14 references)

Male Sprague-Dawley rats were given a single ip injection of 20 mg *o,p'*-DDT or the corn oil vehicle alone and were sacrificed 48 hr later. Some of the DDT-treated rats were pretreated with thyroxine in an amount equivalent to normal secretion rate of thyroxine plus 50% daily; the thyroxine injections were begun 26 days before DDT treatment and were continued until sacrifice. Miced abdominal fat from all rats was analyzed using electron capture gas chromatography. All pesticide extracted from all fat samples was identi-

fied as unchanged *o,p'*-DDT, and fat from the control rats contained no pesticide. The DDT concentrations in the abdominal fat of the rats treated with pesticide alone varied from 0.74 to 12.40 μg/g (average, 5.57 μg/g). The mean DDT concentration in the rats treated with thyroxine plus DDT was significantly lower (3.43 μg/g; range, 0.96 to 6.20 μg/g). Thus, pretreatment of rats with a slight excess of thyroxine reduces DDT incorporation into the body fat stores.

78-0121. Rehwoldt, R. E. ; Kelley, E.; Mahoney, M. (Environ. Sci. Program, Marist Coll., Poughkeepsie, NY) **Investigations into the acute toxicity and some chronic effects of selected herbicides and pesticides on several fresh water fish species.** *Bull. Environ. Contam. Toxicol.* 18(3): 361-365; 1977. (7 references)

Domesticated guppies (*Lebistes reticulatus*) and striped bass (*Marone saxatilis*), banded killyfish (*Fundulus diaphanus*), pumpkinseed fish, white perch (*Roccus americanus*), American eels (*Anguilla rostrata*), and carp (*Cyprinus carpio*) from the Hudson River in New York were exposed over a 10-mo period to malathion (0.01 ppm), methyl parathion (0.1 ppm), 2,4-D (0.1 ppm), or 2,4,5-T (0.1 ppm). No observable physiological abnormalities occurred in any of the fish after chronic exposure to any of the four pesticides, although the brain acetylcholinesterase levels in all of the Hudson River fish decreased substantially. Breeding experiments with the guppies showed slight decreases in the number of offspring of fish exposed to 2,4,5-T and malathion and slight increases in the number of offspring of fish exposed to 2,4-D and methyl parathion. The four pesticides had no noticeable physiological effects on the young fish.

78-0122. Meier, P. G. ; Hecker, L. H.; Hultgren, D. D. (Sch. Public Health, Univ. Michigan, Ann Arbor, MI 48109) **The effect of methoxychlor on periphyton under natural conditions.** *Bull. Environ. Contam. Toxicol.* 18(3): 370-377; 1977. (9 references)

Seminatural streams fed by Koch-Warner Creek near Saline, Michigan were treated with a methoxychlor-acetone mixture in such a way as to maintain methoxychlor concentrations in the water of 0.5 or 2.0 ppb. Samples of the periphytic community of the streams were collected on glass slides 2-42 days after the beginning of pesticide exposure and samples of the channel water were collected 14-32 days after the beginning of exposure. The average standing crop of organic weight in the channels increased rapidly through days 6-8 after exposure and decreased thereafter; the rate of periphytic accural was independent of the methoxychlor concentration. Chlorophyll *a* accumulated in a similar fashion, except that the increase proceeded at a much slower rate in the channel treated with the highest concentration (2.0 ppb) of methoxychlor. At all times, the autotrophic index in the control and methoxychlor-treated channels exceeded 100, indicating water quality degradation. The numbers of periphyton fluctuated in a pattern similar to that displayed by organic weight and chlorophyll *a*, although the channel receiving 0.5 ppb methoxychlor had a slightly higher average of total organisms per unit area. The methoxychlor-treated channels contained a higher average percentage of filamentous green and blue green algae than the control and the diversity of diatoms decreased in all channels from day 4 through day 32. The nitrate level in the channel water decreased markedly with increasing methoxychlor concentration, although the phosphorus concentration remained constant.

78-0123. Gupta, P. K. ; Chandra, S. V. (Ind. Toxicol. Res. Ctr., Lucknow, India) **Toxicity of endosulfan after repeated oral administration to rats.** *Bull. Environ. Contam. Toxicol.* 18(3): 378-384; 1977. (13 references)

Male albino rats were treated orally for 15 days with 5.0 or 10.0 mg/kg endosulfan or with the peanut oil vehicle alone. In rats given the lower dose of endosulfan, the liver weight was significantly increased, there was moderate dilatation of the sinusoids around the central hepatic veins, minute areas of focal necrosis were seen throughout the liver, and Kupffer cell hyperplasia and a moderate amount of bile duct proliferation were evident. Similar but more marked changes were seen among the rats given the higher dose of endosulfan and three of the animals in this group died before the end of the study period. At 5 mg/kg, endosulfan had no apparent effect on the kidneys, lungs, or testes, whereas the following changes were noted in the animals given 10 mg/kg: marked congestion and focal degeneration in the epithelial lining of the kidney tubules; inflammation in the lung tissue with dilatation of some of the alveoli; and marked degeneration in the seminiferous epithelium of the testes. There were no pathological changes in the brain, small intestine, or adrenals after endosulfan treatment.

78-0124. Ohkawa, H. ; Mikami, N.; Okuno, Y.; Miyamoto, J. (Res. Dept., Pestic. Div., Sumitomo Chem. Co., Ltd., Takarazuka, Hyogo, Japan) **Stereospecificity in toxicity of the optical isomers of EPN.** *Bull. Environ. Contam. Toxicol.* 18(5): 535-540; 1977. (11 references)

The optical isomers of ethyl *p*-nitrophenyl phenylphosphonothionate (EPN) were tested for toxicity in male dd mice, white leghorn hens, houseflies (*Musca domestica*), and rice stem borer larvae (*Chilo suppressalis*). Racemic, (+)-, and (-)-EPN were also examined for delayed neurotoxicity in hens. The compounds were administered ip to the mice, ip and sc to the hens, and topically to the insects. (+)-EPN was more toxic to hens, houseflies, and rice stem borer larvae than the (-)-isomer, whereas both isomers were equally toxic to mice. The (-)-EPN-poisoned hens showed degeneration of the myelin sheaths and swollen and fragmented axons in the sciatic nerve and cervical, thoracic, and lumbar regions of the spinal cord. These changes were accompanied by irreversible paralysis of the legs and moderate acute cholinergic effects which disappeared completely within 1 wk. None of these changes were seen in hens treated with (+)-EPN. Thus, (+)-EPN appears to be a more appropriate insecticide than the racemic compound, since it combines high toxicity to insects and with a lack of delayed neurotoxicity in hens.

78-0125. Iverson, F. ; Newsome, W. H.; Hierlihy, S. L. (Food Directorate, Health Protect. Br., Tunney's Pasture, Ottawa, Canada) **Tissue distribution of ethylenethiuram monosulfide (ETM) in the rat.** *Bull. Environ. Contam. Toxicol.* 18(5): 541-551; 1977. (9 references)

Ethylenethiuram monosulfide (ETM) was administered orally to male and female Sprague Dawley rats in doses of 4-350 mg/kg/day for 1-6 days, and ethylenethiourea (ETU) was administered orally at 5 mg/kg/day for 6 days or ip at 4 mg/kg (single dose). The tissue distribution of these compounds, degradation products of bisdithiocarbamate fungicides, was determined by thin layer chromatography. The 24 hour LD50 for ETM in rats was 240 mg/kg, and the compound showed a biphasic decline in the kidney in both sexes. ETU exhibited a linear decline, all tissues but the thyroid, and the peak concentration in this tissue was considerably higher than for any other tissue. Except for the thyroid, the half-lives of ETU and ETM in the various tissues did not vary significantly, and there were no significant sex differences in the decline of ETM. Thyroid half-lives were about 5-fold higher than for other tissues (about 40 hr for both compounds). During repeated dosing with ETU and ETM, there was a gradual increase in blood concentrations, following a sharp increase after the first dose. Again, the highest tissue concentrations were in the thyroid and the lowest levels were in the fat. ETU was excreted in the urine essentially unchanged, whereas ETM was degraded into several compounds, including ETU. Intact ETM was not found in the urine.

78-0126. Rasanen, L. ; Hattula, M. L.; Arstila, A. U. (Dep. Cell Biol., Univ. Jyvaskyla, Jyvaskyla, Finland) **The mutagenicity of MCPA and its soil metabolites, chlorinated phenols, catechols and some widely used slimicides in Finland.** *Bull. Environ. Contam. Toxicol.* 18(5): 565-571; 1977. (24 references)

The Salmonella/mammalian microsome mutagenicity test was used to determine the mutagenicity of MCPA and its soil metabolites, chlorinated phenols, catechols, and the Fennosan compounds used as slimicides and fungicides in the wood-pulp industry. The test was based on the use of *Salmonella typhimurium* bacteria which cannot grow on histidine-deficient medium as test organisms for carcinogenicity and mutagenicity. None of the test compounds caused a significant increase in revertant colonies under conditions where increased back mutations occurred in plates containing control mutagens (benzo(a)pyrene, 2-aminofluorene, 9-aminoacridine, and methylnitro nitrosoguanidine). According to the tier system of mutagen testing, however, the test system used belongs to the first tier and a negative result would not completely exclude the possibility that the compounds tested might be mutagenic or carcinogenic. Since the use of MCPA is increasing and new possible sources of chlorinated phenols and catechols are found appearing, the results observed in this experiment should be confirmed by using mutagenicity tests of the second tier.

78-0127. Kohli, K. K. ; Siddiqui, F. A.; Venkitasubramanian, T. A. (Dept. Biochem., Vallabhbhai Patel Chest Inst., Univ. Delhi, Delhi, India) **Effect of dieldrin on the stability of lysosomes in the rat liver.** *Bull. Environ. Contam. Toxicol.* 18(5): 617-623; 1977. (21 references)

The effect of dieldrin on the bound and free activity of cathepsin, acid ribonuclease, acid phosphatase, and aryl sulphatase was studied. Male Wistar rats were given a single oral dose of dieldrin (30 mg/kg) in groundnut oil or the oil vehicle alone, then were fasted for 22-24 hr before sacrifice. Dieldrin increased the activity of free acid ribonuclease, cathepsin, and acid phosphatase, but had no observable effect on the activity of free aryl sulphatase. The pesticide thus labilized the rat liver lysosomes, releasing the lysosomal enzymes. The role of the increased activity of the free lysosomal enzymes in dieldrin-treated rats is not clear. The increased activity of free cathepsin may or may not be responsible for the increased breakdown of proteins. It is also possible that the effect of dieldrin on mitochondrial morphology may be mediated through the lysosomal enzymes.

78-0128. Hassan, A. ; Abdel-Hamid, F. M.; Afifi, L. M. (M. E. Regional Radioisotope Ctr., Dokki, Egypt) **Chemistry and toxicology of pesticide chemicals. V. Some pharmacological aspects of Leptophos exposure in the rat.** *Bull. Environ. Contam. Toxicol.* 18(5): 640-647; 1977. (14 references)

Male albino rats were maintained for 12 wk on diets containing 10, 30, or 90 ppm Leptophos. Urine levels, erythrocyte and plasma cholinesterase activity, brain, acetylcholinesterase activity, renal glomerular function, tubular phosphorus reabsorption, and hepatic function were determined at 3-wk intervals. Cholinesterase activity in the erythrocytes was inhibited in a dose-dependent fashion, maximum inhibition (greater than 60%) occurring after 3 wk at 90 ppm. The enzyme activity slowly recovered thereafter, approaching baseline levels even before withdrawal of the pesticide at 10 and 30 ppm. The degree of inhibition of the plasma enzyme was much smaller than that of the RBC enzyme. There was no inhibition at 10 ppm, mild inhibition at 30 ppm, and maximum inhibition after 6 wk at 90 ppm. Recovery followed the same pattern as with the erythrocyte enzyme. Brain acetylcholinesterase was significantly inhibited by 30 and 90 ppm Leptophos, the enzyme activity slowly returning to normal within 18 wk after cessation of treatment. Alkaline phosphatase activity increased after 3 wk and decreased below control levels thereafter, whereas serum glutamic pyruvic transaminase activity remained elevated during intoxication. Both activities returned to near normal within 18 wk after cessation of treatment. Tubular phosphorus reabsorption and urinary VMA levels were unaffected, although the BUN values increased after 12 and 15 wk. There were no observable changes in the hemograms, fasting blood glucose levels, urine, body weights, or organ weights during treatment.

78-0129. Meiniel, R. **Activites cholinesterasiques et expression de la teratogenese axial chez l'embryon de Caille expose aux organophosphores. [Cholinesterase activity and expression of axial teratogenesis in the phosphate-exposed quail embryo.]** *C. R. Hebd. Acad. Sci. Paris* 285(4): 401-404; 1977. (13 references) (French)

Teratogenesis in the quail embryo exposed to phosphates is discussed. Axial teratogenesis and cholinesterase inhibition on exposure to a high concentration of malathion (1,000 μg) were examined). This concentration slightly reduced the cholinesterase activity but did not produce morphogenetic disorders. Bidrin at 250 μg and parathion at 100 μg strongly inhibited the cholinesterase activity, producing drastic axial deformities. The use of graduated concentrations of parathion showed that these axial abnormalities took place with a high level of cholinesterase inhibition. With organophosphorus compounds, there is a good correlation between the axial teratogenesis and the cholinesterase inactivation.

78-0130. Nicot, G. ; Vallette, J. P. (Serv. Pharmacol., U.E.R. Sci. Med. Pharm., 87032 Limoges Cedex, France) **Mise en evidence de l'action de la L-phenylalanine sur l'activite arylesterasique par des inhibiteurs des esterases. [Demonstration of the action of L-phenylalanine on the arylesterase activity by means of esterase inhibitors.]** *C. R. Soc. Biol. (Paris)* 171(3): 626-630; 1977. (16 references) (French)

The influence of the esterase inhibitors sodium diisopropylfluorophosphate (DFP; 1.8 m*M*), physostigmine base (1.7 m*M*), sodium *p*-chloromercury benzoate (PCMB; 1 m*M*) and mercuric chloride (MCh, 1 m*M*) on the arylesterase activity of guinea pig red blood cell esterase was studied with or without L-phenylalanine *in vitro* by determining the hydrolysis of phenyl acetate by arylesterases. In the absence of L-phenylalanine, the arylesterase activity was significantly higher in summer (4.14 ± 0.03 U) than in winter (3.85 ± 0.03 U). All inhibitors tested inhibited the arylesterase activity significantly, with DFP being the most active inhibitor, reducing the enzyme activity to 1.38 ± 0.04 U in winter and to 1.52 ± 0.04 U in summer. L-Phenylalanine caused a highly significant increase of the arylesterase activity in winter, but only a slight increase in the summer. In cultures treated with L-phenylalanine (0.22 m*M*) the arylesterase activity was significantly higher in the presence of DFP and physostigmine base than in the absence of L-phenylalanine. The findings indicate a seasonal variation in the arylesterase activity similar to that observed for the cholinesterase activity.

78-0131. Hummon, W. D. ; Hummon, M. R. (Dept. Zool. Microbiol., Ohio Univ., Athens, OH 45701) **Use of life table data in tolerance experiments.** *Cah. Biol. Mar.* 16(5): 743-750; 1975. (6 references)

The effects of increasing concentrations of DDT on the life table parameters of the common gastrotrich *Lepidodermella squammata* were investigated. Just-hatched *L. squammata* were cultured individually in slide depressions, and life history data were collected at half-day intervals under control and test conditions for 50 individuals. Statistical significance of the results is determined by splitting the life table data in two halves and calculating two new life tables for each set of conditions, thereby increasing from one to three the estimates of life table parameter values for each of several sets of conditions. A One Way, Model I analysis of variance is then conducted on the results, sequentially removing data for sets of conditions least to most like those of control conditions until no significant difference ($p < 0.10$) occurs among values of the remaining data sets. In this study significant differences among data from control, 0.05, 0.5, and 5 ppm DDT conditions; and from control, 0.05, and 0.5 ppm DDT conditions were found for the life table parameters *ex*, *R*o, and *r*max.

78-0132. Glooschenko, V. ; Lott, J. N. A. (Dep. Biol., McMaster Univ., Hamilton, Ont., Canada L8S 4K1) **The effects of chlordane on the green algae *Scenedesmus quadricauda* and *Chlamydomonas sp.*** *Can. J. Bot.* 55(23): 2866-2872; 1977. (22 references)

The effects of chlordane on the green algae *Scenedesmus quadricauda* and *Chalamydomonas* sp. were studied. Chlordane was studied at concentrations of 0.1, 1.0, 10.0, 50.0, and 100 μg/l. The first three treatment levels approximate concentrations of chlordane which might be found in contaminated aquatic ecosystems. Photosynthetic, respiratory, cell division, and ultrastructural responses of algal cells to this pesticide were determined. Concentrations of 0.1 to 100 μg/l significantly stimulated cell division of *Scenedesmus quadricauda*. Concentrations of 0.1 to 50 μg/l stimulated growth of *Chlamydomonas sp.* However, 100 μg/l was inhibitory to cell division in this species. Significant stimulatory effects on the respiration rates of these two species were noted at all concentrations within 3 to 4 hours of chlordane addition. Stimulation of respiration increased with increasing chlordane concentrations. Similar stimulatory effects on respiration were noted using 2,4-dinitrophenol. Long-term inhibition of photosynthetic response of *Scenedesmus quadricauda* treated with the higher concentrations was noted over the course of the experiment, even though significant increases in cell numbers over controls occurred. A highly significant chlordane-light interaction was noted on photosynthesis of both *S. quadricauda* and *Chlamydomonas sp.*

78-0133. Arsenault, A. L. ; Gibson, M. A.; Mader, M. E. (Dept. Biol., Acadia Univ., Wolfville, Nova Scotia) **Hypoglycemia in malathion-treated chick embryos.** *Can. J. Zool.* 53(8): 1055-1057; 1975. (13 references)

The possibility that malathion-induced micromelia is associated with hypoglycemia was investigated. Fertilized White Leghorn chick eggs were incubated for use in the study. A single injection was made into the yolk mass of 0.1 ml of 2% malathion in corn oil on day 5 of incubation. All of the embryos so treated were hypoglycemic, and there was no overlap between the blood sugar levels in the treated embryos and those in controls. At the hatching stage, the blood sugar levels of the treated chicks were increased and some specimens exhibited hyperglycemia. The hypoglycemia persisted throughout the incubation period until day 19.

78-0134. Jackson, S. B. ; Gibson, M. A. (Dep. Biol. Acadia Univ., Wolfville, N.S., Canada BOP 1XO) **A histological study of early chondrification in malathion-treated chick embryos, with emphasis on cell numbers, cell size, and patterns**

of matrix deposition. *Can. J. Zool.* 55(9): 1515-1522; 1977. (14 references)

Chick embryos were given a teratogenic dose of malathion at the 5-day incubation stage and its effects on the early histogenesis of the tibiotarsus were studied during the 8- to 20-day incubation period. This investigation included studies of the growth rate as indicated by mitotic index and the number of cells per unit area, of cell activity as indicated by cell size and the amount of matrix per cell, and of matrix formation as indicated by rates of deposition and erosion and by histochemical staining. The malathion caused an increased proliferation of the chondroblasts during the initial chondrification stages only. It led to an increase in the number and size of the chondrocytes, particularly in areas of reduced matrix deposition. The malathion primarily influenced the deposition of the ground substance, causing: (1) a reduction in the amount of ground substance deposited, (2) a reduction in the degree of sulfation and polymerization of that ground substance which was deposited, and (3) a lysosomal-mediated resorption of the formed matrix along the epiphyseal-diaphyseal border. In these ways, the malathion causes a reduction in the growth rate of the tibiotarsus and a weakening of the cartilage model which subsequently results in a bending of the tibiotarsus.

78-0135. Wattenberg, L. W. ; Lam, L. K. T.; Fladmoe, A. V.; Borchert, P. (Dep. Lab. Med Pathol., Univ. Minn., Minneapolis, MN 55455) **Inhibitors of colon carcinogenesis.** *Cancer* 40(5 Suppl.): 2432-2435; 1977. (15 references)

Possible inhibition of colon carcinogenesis by disulfiram and sodium diethyldithiocarbamate was studied. The chemicals, when added to the diet, inhibited 1,2-dimethylhydrazine (DMH) induced neoplasia of the large bowel in female CF1 mice. A third pesticide, chlorpropham, was inactive. Both maneb and bis(ethylxanthogen) contain a carbon disulfide moiety, whereas the comparable moiety is lacking in chlorpropham. Previous studies also have suggested that compounds which can be metabolized to carbon disulfide would be expected to inhibit DMH-induced neoplasia, whereas a chemical which lacks sulfur would be inactive. The finding that bis(ethylxanthogen) inhibits DMH demonstrates that nitrogen is not required in inhibitors, thus avoiding the complication of possible nitrosamine formation. In other work disulfiram inhibited the carcinogenic effect of azoxymethane (AOM) on the large bowel. Under comparable conditions the inhibition of AOM was considerably less than that obtained with DMH as the carcinogen. The data suggest that disulfiram inhbits DMH metabolism at more than one oxidative step.

78-0136. Corbett, T. H. (U. S. Vet. Admin. Hosp., Ann Arbor, MI) **Consumer products.** *Cancer and Chemicals, Nelson-Hall, Chicago* pp. 67-87; 1977.

The relation of pesticides to cancer is reviewed. Several pesticides have been shown to produce cancer in various laboratory animals. The best known insecticide, DDT, is a long-lasting pesticide and as such accumulates in food chains. The finding of concentrations of such chemicals in human tissues is discussed, with some concern given to those individuals who are occupationally exposed to pesticides. Tumor producing properties of DDT and other pesticides are considered. The tumor-producing effects of pesticides from spray cans has been investigated, and the findings of such studies are briefly considered. Problems and concerns about dieldrin, chlordane, and heptachlor are reviewed. Efforts are underway to curb the indiscriminate use of such chemicals. The major issue is the fact that trace amounts of pesticides enter our bodies from food, air, and water. How much pesticide intake can be tolerated without damage to health is not known. The carcinogenic effects may be initiated at extremely low levels.

78-0137. Poradovsky, K.; ; Rosival, L.; Meszarosova, A. **Transplacental permeation of pesticides during normal pregnancy.** *Cesk. Gynekol.* 42(6): 405-410; 1977. (23 references) (Czech)

Levels of DDT, DDT metabolites, β-BHC, and γ-BHC were monitored in the blood of pregnant and nonpregnant women, in the fetal ovum during the first trimester, and in the placenta at the end of pregnancy. No significant differences in the blood levels of pesticides in pregnant and nonpregnant women were observed. The pesticide levels in the blood, chorion, and placenta of pregnant women were in approximately the same range. A dramatically increased concentration of pesticide levels in the subcutaneous fat of pregnant women and in the vernix caseosa of their newborn children was observed. In some pregnant women the concentration of pesticide was excessively high, but no premature terminations of pregnancy nor harmful effects upon intrauterine fetal development were observed.

78-0138. Wooder, M. F. ; Wright, A. S.; King, L. J. (Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent, England) **In vivo alkylation studies with dichlorvos at practical use concentrations.** *Chem. Biol. Interact.* 19(1): 25-46; 1977. (37 references)

In vivo alkylation studies were made using dichlorvos at concentrations encountered in practical use situations. Twenty male CFE rats were exposed to atmospheric dichlorvos at 0.064 μg/l for 12 hours. DNA and RNA analysis from the total soft tissues of these rats showed no methylation of the N7 atom of guanine moieties. In these experiments the limits of detection of methylation were one methyl group per 6.0×10^{11} and per 2×10^{9} nucleotide units for DNA and RNA, respectively. At these limits only 0.000001% of the administered dose would have had to react with DNA in order to produce detectable methylation of this macromolecule. The half-life of 7-methylguanine moieties in DNA is 3 days. The exposure period used in this study, 12 hours, constitutes a significant fraction of this half-life period. With this information, and the extremely rapid metabolism of dichlorvos in a wide range of mammalian tissues and species, it is concluded that dichlorvos does not methylate the nucleic acids of mammalian tissues when it is inhaled continuously at practical use concentrations.

78-0139. Wharry, D. (Univ. College, PO Box 78, Cardiff CF1 1XL, Wales) **Pyrethrum animal experiments.** *Chem. Br.* 13(11): 437; 1977. (1 reference)

A letter-to-the editor refers to a recent article in which a procedure to investigate the effect of pyrethrum on the serum proteins of Indian desert gerbils was described. Pyrethrum extract in this method was dissolved in petroleum ether and aliquote were then injected into animals. However, the letter points out that, in scaling this up to human levels, an enormous, painful and damaging injection of about 0.5 liter of solvent with or without 5-15 grams of the pyrethrins would be required. The validity of the exercise is questioned, since in nature such an introduction of an insecticide would not take place. Thus the research cited is criticized for the apparently inhumane treatment of the experimental animals, and also for what appears to be misguided research objectives and experimental procedures.

78-0140. Zapp, J. A. (Haskell Lab. Toxicol. and Indust. Med., Du Pont Co., Wilmington, DE) **HMPA experiments.** *Chem. Eng. News* 54(5): 3; 1977.

The chronic toxicity of hexamethylphosphoramide (hempa), a compound used effectively as a chemosterilant for insects, was investigated. Four groups of 120 male and 120 female rats each were exposed to 0, 50, 400, or 4,000 volumes per 10^9 volumes of hempa for 6 hr/day, 5 days/wk. Between the sixth and eighth months an excess of fatalities due primarily to degenerative changes in the renal convoluted tubules occurred in the two highest exposure groups. The rats, sacrificed during the eighth month were found to have squamous cell carcinomas, the incidence of which was dose related. These studies indicate that hempa can induce squamous cell carcinoma in rats after eight months of exposure by inhalation in concentrations as low as 400 ppb.

78-0141. Ishii, H. ; Suga, T.; Niinobe, S.; Inatsu, Y. (Tokyo Coll. Pharmacy, Tokyo, Japan) **Effect of 3-amino -1,2,4-triazole on carbon tetrachloride-induced necrosis.** *Chem. Pharm. Bull. Jap.* 25(8): 2035-2040; 1977. (12 references)

The effect of 3-amino -1,2,4- triazole (AT) on carbon tetrachloride induced necrosis was examined by investigating the change in serum transaminase (GOT and GPT) levels. In addition, subcellular distribution and the solubilization caused by freezing and thawing of lysosomal enzyme were examined. The injection of carbon tetrachloride (0.1 ml per 100 g, i.p.) markedly increased SGOT and SGPT activities. The increase was reduced by about 60% after both pre- and post-treatment with AT (100 mg/100 g i.p.). By biochemical and histological techniques it was shown that treatment with AT also repressed the fatty liver which occurs along with liver necrosis. The effect of carbon tetrachloride and AT on subcellular distribution of acid phosphatase was examined. AT repressed enzyme release from light mitochondrial fraction to supernatant fraction caused by carbon tetrachloride. AT significantly depressed the release of enzyme from the liver lysosomes by freezing and thawing in both the control- and carbon tetrachloride treated rat. These results indicate that AT shows a depressing effect on fatty liver, a stabilizing effect on lysosomes, and a repression of liver necrosis.

78-0142. Van Miller, J. P. ; Lalich, J. J.; Allen, J. R. (Dept. Pathol., Univ. Wisconsin, Madison, WI 53706) **Increased incidence of neoplasms in rats exposed to low levels of 2,3,7,8-tetrachlorodibenzo *-p-* dioxin.** *Chemosphere* 6(9): 537-544; 1977. (15 references)

Male Sprague-Dawley rats were maintained for 78 wk on a diet containing 1-1,000 ppb or 1-500 ppt of TCDD (dioxin). The animals were then placed on control diets and sacrificed 17 wk later. TCDD at 50-1,000 ppb produced acute toxicity in all animals, resulting in significantly reduced food intake, lack of weight gain, and death within 2-4 wk. Atrophy of the thymus and spleen, dilatation of the common bile ducts, hemorrhage in the gastrointestinal tract, severe liver necrosis, decreased spermatogenesis, and cellular proliferation and edema of the common bile ducts were observed. Food intake and weight gain among most of the animals given the lower doses of TCDD did not differ from control levels, although all animals given 1 and 5 ppb TCDD died within 90 wk; mortality figures among the animals given 1-500 ppt varied from 20-50%, as compared with 60% among the controls, after 95 wk. Nineteen (57%) of the animals that died after receiving subacute doses of TCDD had neoplastic alterations, as did four of the sacrificed animals. The overall incidence of neoplasms among the animals fed the subacute doses was 38%. No neoplasms were observed in any of the control rats. The data suggest, but do not conclusively prove, that TCDD is a carcinogen.

78-0143. El-Oshar, M. ; Dauterman, W. C. (Toxicol. Progr. Dept. Entomol., North Carolina State Univ., Raleigh, NC 27607) **Studies on the metabolism of formothion.** *Chemosphere* 6(10): 611-616; 1977. (7 references)

The mechanism by which formothion is deformylated was investigated. Incubation of C-14-labeled formothion with three subcellular rat liver fractions at 37°C and pH 7.4 resulted in alteration of all of the formothion within 30 minutes. The denatured non-enzymatic control gave identical results, indicating that the mechanism for the formation of dimethoate and dimethoate monoacid was not dependent on enzymatic oxidation or reduction reactions. The only metabolites identified were dimethoate and dimethoate monoacid. No dimethoxon was found. Incubation of C-14-formothion at various pH's at 37°C resulted in formation of dimethoate and dimethoate monoacid. At an acid pH the rate of formation was much slower than at an alkaline pH. At a physiological pH of 7.4, which is associated with most mammalian systems, more than 90% of the formothion was altered after 30 minutes. There was little effect of various cations on the in vitro breakdown of formothion. Thus degradation appears to be primarily dependent on the pH of the solution.

78-0144. Van Miller, J. R. ; Lalich, J. J.; Allen, J. R. (Dept. Pathol., Univ. Wisconsin, Madison, WI 53706) **In-**

creased incidence of neoplasms in rats exposed to low levels of 2,3,7,8-tetrachloro-dibenzo -*p*- dioxin. *Chemosphere* 6(10): 625-632; 1977. (15 references)

Rats were fed various levels of TCDD in their diets to determine the toxicity and possible carcinogenicity from low level exposure to this compound. Male Sprague-Dawley rats were fed diets containing one of the following concentrations of TCDD: 1, 5, 50, or 500 ppt; or 1, 5, 50, 500, or 1,000 ppb. A high incidence of neoplasms was found in rats fed subacute levels of TCDD, which suggests the carcinogenic potential of the compound. The tumors of ductal epithelium and the cholangiocarcinomas are consistent with findings in nonhuman primates. The possibility that TCDD is a potent promotor of neoplastic changes rather than an inducer must be examined. The wide variety of neoplasms observed in the current study is not consistent with many of the known chemical carcinogens. Reports of increased liver cancer in Vietnamese 8 to 10 years following exposure to defoliants containing TCDD supports a promotion mechanism for neoplasms caused by TCDD. While the findings of this study do not allow the conclusion that TCDD is a carcinogen, the increased incidence of neoplastic alterations in rats fed levels of TCDD as low as 5 ppt is of obvious concern.

78-0145. Ernst, W. (Inst. Meeresforschung, 2850 Bremerhaven, Germany) **Determination of the bioconcentration potential of marine organisms - A steady state approach. I. Bioconcentration data for seven chlorinated pesticides in mussels (*Mytilus edulis*) and their relation to solubility data.** *Chemosphere* 6(11): 731-740; 1977. (20 references)

The bioconcentration data for seven chlorinated pesticides was determined in mussels (*Mytilus edulis*) and the relation of this data to solubility data was determined. A steady state approach was used in these experiments. Therefore, mussels were exposed to a given initial concentration of the pollutant in sea water aquaria. During accumulation of the substance, the decreasing concentration in the water was measured. The experiment was terminated after a constant concentration in the water was attained. Accumulation levels in mussels were determined and related to the steady state concentration in the water. The results of this study showed that mussels were suitable as a test animal in view of the good approach to equilibrium concentrations found in a short test period. This finding offers uncomplicated maintenance of the test organism and also makes the loss of test compounds by evaporation negligible in short periods. Moreover, mussels showed little capability of metabolic degradation. For highly volatile substances it is suggested that the usual dynamic system or a closed system be used.

78-0146. Berry, J. D. ; Stotter, D. A. (Dept. Chem., Univ. Essex, Wivenhoe Park, Colchester, CO4 3SQ, Essex, England) **Dechlorination of DDT by vitamin B_{12} under mild reducing conditions.** *Chemosphere* 6(11): 783-787; 1977. (19 references)

The dechlorination of DDT by vitamin B12 was studied under mildly reducing conditions. The study demonstrated that hydroxycob(II)alamin is an effective reducing agent for DDT under mild conditions. In light or dark conditions hydroxycob(II)alamin reduced DDT to DDD quantitatively, no reaction occurring unless the cobalamin was in the reduced form. It is suggested as likely that the reaction of cob(II)alamins with DDT and other chlorinated insecticides occur via homolytic bond cleavage; the corresponding reaction with DDD is much slower because the decreased number of geminal chlorines increases the reduction potential of the carbon-chloride bond.

78-0147. Hassan, A. ; Winteringham, F. P. W. (Jt. FAO/IAEA Div., Vienna, Austria) **Leptophos.** *Chemosphere* 6(11): 789-790; 1977. (11 references)

Data are given concerning leptophos, a contact and systemic insecticide used on fruits, vegetables and cotton. The substance offers effective control against some forest pests, but its usage trends are uncertain pending further toxicological data. Information provided concerns the chemical structure of the parent compound, metabolites, and qualitative composition of residues; persistence of residues, effective half-lives; typical residues found following agricultural usage; and notes on toxicological mechanisms and ecotoxicology. Quantitative biological response data, primary standards, derived limits, isotopic syntheses, and analytical methods for determination are discussed.

78-0148. Mitchelson, F. ; O'Shea, R. A. (Dept. Pharmacol., Victorian Coll. Pharm., Parkville, Australia) **Sensitivity changes in guinea-pig atria and ileum following subacute administration of dyflos.** *Clin. Exp. Pharmacol. Physiol* 4(6): 533-543; 1977. (32 references)

A study was made to determine the extent of subsensitivity development to cholinomimetics in the ileum and atrium of the guinea pig following dyflos administration. Male guinea-pigs were given s.c. injections each day for a ten day period of a freshly prepared solution of dyflos in normal saline. Dyflos was given at the rate of 1.2 mg/kg, s.c. This dosage led to the development of subsensitivity to carbachol in the ileum but not in the electrically stimulated left atrium. Atria from dyflos-pretreated animals became supersensitive to acetylcholine, but the ileum became subsensitive to this agonist despite marked inhibition of cholinesterases. The degree of subsensitivity was less than for carbachol. Subsensitivity was also noted to histamine and was of a similar order to that observed for carbachol. This finding supports the suggestion that subsensitivity is a nonspecific post-receptor mechanism. Other changes in the ileum aside from the increase in the EC-50 value to agonists were an increase in tissue mass, an increase in the slope of the concentration-response curve to agonists and an increase in the maximal response to agonists.

78-0149. Nebert, D. W. ; Levitt, R. C.; Orlando, M. M.; Felton, J. S. (Natl. Inst. Child Health and Human Development, Bethesda, MD 20014) **Effects of environmental chemi-**

cals on the genetic regulation of microsomal enzyme systems. *Clin. Pharmacol. Ther.* 22(5): 640-658; 1977. (79 references)

A consideration of studies concerning the cytochrome P-450 mediated oxygenase system involving the metabolic potentiation and/or detoxification of many drugs and environmental pollutants is presented. Arochlor 1254, lindane, bromobenzene, zoxazolamine, and 2,3,7,8-TCDD were among the compounds tested. Genetic crossing of inbred strains of mice was used to demonstrate that a single allelic difference, or a very small number of genes can have a profound influence on an individual's increased susceptibility to cancer or to the action of various environmental toxins. The response of a population to environmental chemicals would be expected to be complex, reflecting the complexity of the genetic predisposition of individuals in the population. The results of the sibling studies discussed in this review demonstrate the complexity of the dose-effect relationship because differences in the metabolism of environmental compounds can be regulated by a relatively small number of genes.

78-0150. Vesell, E. S. (Dept. Pharmacol., Pennsylvania State Univ. Coll. Med., Hershey, PA 17033) **Genetic and environmental factors affecting drug disposition in man.** *Clin. Pharmacol. Ther.* 22(5, part 2): 659-679; 1977. (71 references)

A comprehensive study of genetic and environmental factors affecting drug disposition in man are presented, and the techniques used to study these factors are discussed. Large individual variations in drug response can arise from multiple genetic and environmental factors affecting drug absorption, distribution, biotransformation, excretion, interaction with receptor sites, and combinations of these. Environmental chemicals, such as DDT, PCB, and the polycyclic hydrocarbons, can alter through induction the basal, genetically controlled hepatic drug metabolizing activity. In normal individuals, it would be expected for rates of drug metabolism to increase with age due to cumulated exposure to these environmental chemicals.

78-0151. Azarnoff, D. L. (Clin. Pharmacol. and Toxicol. Cen., Dept. Med., Univ. Kansas Med. Cen., Kansas City, KS 66103) **Insecticides: Effect on drug metabolism.** *Clin. Pharmacol. Ther.* 22(5, part 2): 817-822; 1977. (45 references)

Data from various studies concerning the effects of chlorinated organic insecticides on the half-life and rate of elimination of a variety of drugs in laboratory animals, and in humans and birds occupationally and environmentally exposed, respectively, to pesticides are reviewed. The compounds studied were isomers and metabolites of DDT, chlordane, and zoxazolamine. Species differences were observed for some of these compounds, e.g., DDT decreased hexobarbital sleep time of rats but had no effect on mice. Exterminators exposed to a mixture of chlorinated organic insecticides showed decreased antipyrine plasma elimination half-lives, and workers in a DDT factory showed decreased plasma half-lives of phenylbutazone. Induction of mixed-function oxidase (MFO) was associated with increased frequency of eggshell breakage and decreased eggshell weight in breeding birds, perhaps due to excessive steroid inactivation secondary to induction of MFO activity.

78-0152. Rhodes, M. L. ; Patterson, C. E. (Dept. Med., Indiana Univ. Sch. Med., Indianapolis, IN) **Effect of exogenous superoxide dismutase on paraquat toxicity.** *Clin. Res.* 25(4): 592A; 1977.

The protective effect of exogenous superoxide dismutase (SOD) in paraquat toxicity was studied using 91 mice which were given 25 mg/kg paraquat chloride i.v. for 1 hour after receiving 10 mg/kg SOD, also administered i.v. This was followed by 4 additional SOD injections at 24 hr intervals. A 46% mortality was incurred at 7 days, compared to a 49% mortality in 91 mice given paraquat alone. Neither was any significant difference found in mortality between 20 mice given paraquat plus SOD (35 mg/kg, i.p., for 5 days) begun 1 hr after the paraquat injection. A higher mortality was found with SOD treatment at all three paraquat levels even though the differences were not significant. A previous study using injection of radioactive SOD demonstrated that increases in tissue levels were infinitesimally small compared to endogenous levels. Thus it is concluded that intermittent exogenous SOD does not protect mammalian lungs from oxidative damage by paraquat.

78-0153. Livingston, R. J. (Dept. Biol. Sci., Florida State Univ., Tallahassee, FL) **Review of current literature concerning the acute and chronic effects of pesticides on aquatic organisms.** *Crit. Rev. Environ. Control* 7(4): 325-351; 1977. (258 references)

A comprehensive review of the literature concerning the acute and chronic effects of pesticides on aquatic organisms is presented. The pesticides considered in this review are herbicides (dichlone, 2,4-D), fungicides (captan), organochlorine insecticides (endrin, DDT, dieldrin, toxaphene, methoxychlor, lindane, heptachlor, aldrin, chlordane, BHC, mirex), organophosphorus insecticides (azinphosmethyl, chlorpyrifos, malathion, parathion, dichlorvos, trichlorfon) and carbamate insecticides (carbaryl). This review points to the need for a greater emphasis on field testing and ecological analysis to complete the natural sequences of hypotheses derived from laboratory experimentation.

78-0154. Gough, B. J. ; Shellenberger, T. E. (Natl. Center for Toxicol. Res., Jefferson, AR 72079) **In vivo inhibition of rabbit whole blood cholinesterase with organophosphate inhibitors and reactivation with oximes.** *Drug Chem. Toxicol.* 1(1): 25-43; 1977-78. (8 references)

This study was undertaken to investigate the responses of rabbit whole blood cholinesterase following i.v. infusion of a series of dialkylphosphate inhibitors (primarily dimethyl phosphates) differing only in the structure of the acidic residue. The effects of various oxime reactivators of inhibited enzyme were also investigated to attempt to elucidate the mechanism of enzyme inhibition and spontaneous

recovery and to compare the activity of the various reactivators. The dimethyl phosphates Bidrin (cortoxyphos), C-2307, DDVR (dichlorvos), Gutoxon (azinphosmethyl), and the oxygen analog of C-9491 (iodofenphos) produce dose- and time-related inhibition of cholinesterase during infusion; inhibited enzyme recovered spontaneously to 60-80% of normal activity within 60-90 minutes after infusion. Azodrin-induced inhibition was dose- and time-related, but immediate spontaneous recovery was neglgible. Injection of 2-PAM (pralidoxime) immediately following infusion produced rapid almost complete reactivation of cholinesterase (progressively less reactivation was seen at 1-3 hours following infusion of all dimethyl phosphates). Enzyme inhibited with SD-1652, a dimethyl phosphate, was reactivated by 2-PAM up to at least 48 hours following inhibitor infusion. TMB-4 (lobidoxime) and P-2-S produced marked enzyme reactivation when injected immediately following inhibitor infusion; MINA and DAM were not effective at doses greater than 100 mg/kg. The results suggest that spontaneous reactivation of inhibited cholinesterase may be due partially to a reversal of the enzyme inhibitor complex as well as to hydrolysis of the dialkyl phosphorylated enzyme.

78-0155. Fuzesi, I. (MEM Plant Sci. Agrochem. Inst., Toxicol. Lab., Keszthely, Hungary) **Absorption and excretion of reglone herbicide in cattle fed with treated fodder.** *Egeszsegtudomany* 21(2): 190-194; 1977. (12 references)

The absorption and excretion of reglone (diquat dibromide) in cows were investigated. Rape groats containing 0.45 or 50 mg/kg reglone and sunflower groats containing 55 mg/kg reglone were used in the experiments. After 31 days of foddering with the reglone contaminated feed no harmful effects on the health and milk production of the cows were noted. Milk samples taken every other day contained less than 0.005 mg/kg reglone, as did urine samples. Visceral organs, neural tissue, bone marrow, and adipose tissue also contained less than 0.005 mg/kg reglone. Reglone was excreted in the feces.

78-0156. Miteva, D. (Faculty of Biology, "Kliment Okhridski" Univ., Sofia, Bulgaria). **Vliyanie na nyakoi kherbitsidi vurkhu pochvenite protozoi (*Protozoa*). [Influence of some herbicides on soil Protozoa.]** *Ekologiya* 2: 56-60; 1976. (7 references) (Bulgarian)

The influence of the herbicides Kobex (trifluralin) and SGA-10832 (2,6-dinitro -4- trifluoromethyl-*N*-cyclopropylmethyl- *N*-*n*-propylaniline) on *Rhizopoda*, *Flagellata* and *Infusoria* was studied in the upper 20-cm layer of chernozem type soil at different dates after treatment in early May. Kobex was applied at a rate of 200 $cm^3/10\ m^2$, and SGA-10832 at a rate of 250 $cm^3/10\ m^2$. The herbicides had an inhibitory effect on the rhizopods and flagellates, while the infusoria population remained unchanged. Kobex was more toxic to the rhizopodal fauna than SGA-10832, but its action was of shorter duration than that of SGA. The density of rhizopads in 1 g of soil treated with Kobex was 2.5 times lower than that of soil treated with SGA-10832. Both agents inhibited flagellates to considerable extent only in May. The herbicides caused no significant changes in the species composition of the protozoan population of the soil.

78-0157. Bakalivanov, D. (N. Pushkarov Inst. of Soil Sci. and Crops Planning, Bulgaria). **Vzaimodeistvie na kherbitsida simazin s pochvenata mikroflora. [Interaction of the herbicide simazine with the soil microflora.]** *Ekologiya* (2): 78-85; 1976. (10 references) (Bulgarian)

The influence of simazine on the soil microflora (bacteria, *Actinomycetes*, fungi and algae) was studied in the upper 26-cm layer of different soils (brown, cinnamon and grey forest soils, leached chernozem, alluvial meadow soil, and "smolnitsa"). Simazine was applied at a rate of 100 g/10 m^2 (with 50% active agent content). The clay content of the soils was in the range of 9.8-52.3%, the humus content was 1.2-10.8%, and the soil pH was 5.0-7.2. Simazine slightly depressed the soil microorganisms during the first 1-2 months only; this was most pronounced in soils with low humus and clay content. In soils with high humus and clay content the inhibitory action of simazine was weaker and of shorter duration due to adsorption of most of the pesticide. Simazine had a certain stimulating effect on the microflora after 2-3 months in some soils. Very rapid decomposition of simazine was observed in the soil during the first 3 months, but residues were found as late as 1 year after application, even though the amounts found were less than 10% of the input. The degradation was slowest in soils with high clay and humus content.

78-0158. Carrera, G. ; Mitjavila, S.; Lacombe, C. (Groupe Rech. Toxicol. Aliment, Boissons, I.N.S.E.R.M., Unite 87, Inst. Physiol., 31400 R Toulouse, France) **Toxicite de l'oxythioquinox (Morestan) administre en solution dans les lipides. [Toxicity of oxythioquinox given in oil solution.]** *Eur. J. Toxicol.* 9(5): 295-301; 1976. (19 references) (French)

The influence of the vehicle used on the toxicity of intragastrically administered oxythioquinox was studied in male Swiss mice and male Sprague-Dawley rats. The LD50 of oxythioquinox administered in aqueous suspension to mice was found to be 2.871 ± 0.0368 g/kg, compared to 0.557 ± 0.0224 mg/kg for the oil solution of this substance. The toxicity of equal doses administered in the form of aqueous suspension or oil solution was studied in rats that received daily doses of 20-100 mg/100 g for up to 16 days. Judged from the retardation of weight gain and the reduction of organ weights as an indicator of the toxic effect of oxythioquinox, this substance was considerably more toxic when administered in oil solution than when given in aqueous suspension. The decrease in the weight gain observed after administration of a 1 g/kg dose in aqueous suspension was about the same as that measured after administration of one fifth of that dose in oil. Given in oil solution, oxythioquinox significantly retarded the gastrointestinal passage of Cr51-labeled EDTA compared with the passage in controls treated with water or oil or in animals treated with aqueous suspensions of oxythioquinox. The findings indicate that the increased toxicity of oxythioquinox in oil solution is due to increased resorption during protracted intestinal passage.

78-0159. Gak, J. C. ; Graillot, C.; Fournier, D.; Truhaut, R.; Radenen, B. (Centre. Rech. Toxicol., Fac. Sci. Pharm. Biol. Paris, 75006 Paris, France) **Differences in susceptibilty of hamsters and rats to the effects of long term administration of ETU.** *Eur. J. Toxicol.* 9(5): 303-312; 1976. (11 references) (French)

Experiments were performed to assess the effects of ethylene thiourea (ETU) in the diet. Rats were fed ETU at 0, 5, 17, 60, and 200 mg/kg body weight. Food consumption, body weight, serum enzyme activities (GPT, alkaline phosphatase), hepatic enzyme activities (GPT, alkaline phosphatase, glucose -6- dehydrogenase), organ weights and histology, and serum cholesterol were the parameters investigated. ETU caused hypercholesterolemia at the 5 mg/kg level in both rats and hamsters. Thyroid dysfunction was the predominant organ dysfunction in rats, and hepatic impairment predominated in hamsters. ETU was found to be carcinogenic at the 60 mg/kg level in male rats and at the 200 mg/kg level in female rats; it was not carcinogenic at the dose levels tested in hamsters.

78-0160. Larsson, B. ; Oskarsson, A.; Tjalve, H. (Dept. Toxicol., Univ. Uppsala, Uppsala, Sweden) **Binding of paraquat and diquat on melanin.** *Exp. Eye Res.* 25(4): 353-359; 1977. (17 references)

The binding on melanin of the quaternary dipyridylium salts paraquat and diquat was studied in vivo in pigmented C57-Bl mice and albino NMRI mice using autoradiography, and was studied in vitro by reaction with pigment from bovine eyes. Paraquat and diquat were strongly bound on melanin both in vitro and in vivo. The in vitro experiments showed that the uptake was concentration dependent and that the uptake of paraquat was inhibited by Na+ and K+. Divalent cations also inhibited the binding of paraquat on melanin, the inhibitory action being greater than for the monovalent cations. H+ effectively inhibited the binding. The results indicate that ionic binding is involved in the uptake of these compounds on melanin and this, in turn, can be ascribed to a cation-exchange activity of the melanin. Further studies are required to establish whether this is due to a more general mechanism for the accumulation of drugs and chemicals on melanin.

78-0161. Dasheiff, R. M. ; Einberg, E.; Grenell, R. G. (Div. Neurobiol., Inst. Psychiatry and Human Behavior, Univ. Maryland Sch. Med., Baltimore, MD 21201) **Sarin and adrenergic-cholinergic interaction in rat brain.** *Exp. Neurol.* 57(2): 549-560; 1977. (23 references)

The purpose of this paper is to describe the methods and results of an investigation of the adrenergic response to changes in the cholinergic system in the rat brain. Sarin was used to assess the effects of an organophosphate anticholinesterase on the catecholamine (CA) stores in nuclei and fiber tracts. Increased catecholamine stores occurred in the locus ceruleus and the zona compacta of the substantia nigra in rats after a one-third median lethal dose of sarin. The values returned to normal after a period of 10 days. The data suggest that catecholamine stores were depleted in the nucleus accumbens septi for more than 10 days. Mechanisms discussed in an effort to explain the results focused on direct versus indirect actions of sarin. A modified technique with formaldehyde-induced fluorescence was used in this work, featuring cryostatic sectioning of fresh-frozen tissue.

78-0162. Holan, G. ; Spurling, T. H. (CSIRO Div. Appl Chem., P.O. Box 4331, Melbourne, Victoria 3001, Australia) **Mode of action of DDT analogues: molecular orbital studies.** *Experientia (Basel)* 30(5): 480-481; 1974. (7 references)

Preliminary results are presented for a method of correlating the activity of DDT analogues with their molecular properties. Because all the molecules studied were selected according to rigorous steric criteria, it is assumed that any difference in activity is due to differences in electronic structure. All insect mortality data were obtained on a susceptible strain (WHO/IN/l) of house flies, which were selected by sex, age, and weight of pupae. The DDT analogues were all potentiated with the mixed function oxidase inhibitor Sesoxane to obtain basic activity comparisons without superimposition of the biochemical degradation of these insecticides. Charge distribution of the molecules was estimated with a molecular orbital calculation method at the CNDO/2 level. The equation relating activity to charge distribution is based on the method of Cammarata.

78-0163. Beznosko, B. K. ; Voronov, I. B.; Feigman, E. E.; Krivenchuk, V. E. (Lab. Pharmacol., I. M. Sechenov Inst. Evolut. Physiol. Biochim., Leningrad, USSR) **O tsentral'nom deistvii novogo reaktivatora kholinesteraz dietiksima. [On the central action of diethyxime--A new cholinesterase reactivator.]** *Farmakol. Toksikol.* 40(5): 531-535; 1977. (Russian)

Experiments were performed to assess the action of diethyxime (*S*-diethylaminoethyl *p*-bromobenzthio hydroximate hydrochloride) a new cholinesterase reactivator. Diethyxime administered to anesthetized cats blocked the effects (e.g., depressed arterial pressure) of armine, an inhibitor of brain cholinesterases when the animals' peripheral muscarinic cholinoreceptors were blocked by the *m*-cholinolytic benzilylcholine. It also abolished depression of phrenic nerve action potentials caused by armine. Dipyroxime, a quaternary diethyxime analogue which is also a cholinsterase reactivator, failed to produce such effects.

78-0164. Korablev, M. V. ; Evets, M. A. (Dept. Pharmacol.) *Farmakol. Toksikol.* 40(5): 603-606; 1977. (8 references)

The antidiuretic action of the dithiocarbamic acid derivatives is discussed. Chemically pure dithiocarbamates, thiuramsulfides and ethylene-bis-dithiocarbamates displayed a well-marked antidiuretic action. They materially reduce diuresis, natri- and kaliuresis in rats at 1/5 the median lethal dose per 1 kg of weight into the stomach and in dogs (sodium N,N-diethyldithiocarbamate, into the renal artery). The

glomerular filtration of the dog's kidneys was inhibited without changing the tubular reabsorption. Furosemide (lasix) prevented the development of the antidiuretic effect and reduction of the sodium and potassium excretion provoked in rats with DEDTC, zinc N,N,N′,N′-tetraethyl - thiuramdisulfide and ethylene-bis-dithiocarbamate. Furosemide is recommended for treatment of acute poisonings with dithiocarbaminic acid derivatives.

78-0165. Dux, E. ; Toth, I.; Kiszely, G.; Dux, L.; Joo, F. (Inst. Biophys., Biol. Res. Ctr., Hungarian Acad. Sci., Szeged, Hungary) **The possible cellular mechanism of 2,4-dichlorophenoxy-acetate-induced myopathy.** *FEBS Lett.* 82(2): 219-222; 1977. (11 references)

Adult rats were given 50 mg/kg/day 2,4-D ip and muscles of different metabolic types were removed 3 wk after the commencement of treatment. The fiber type of the muscles was determined, and the potassium pyroantimonate precipitation technique was used to localize caclium in the muscle tissue. Pyroantimonate deposits (400-750 A) were confined to the sarcoplasmic reticulum of untreated white muscle, and signs of spontaneous contractions were only occasionally observed in these muscles. After 3 wk of treatment with 2,4-D, the majority of fibers were contracted and changes of different severity were observed. A few deposits of 250-400 A pyroantimonate were bound to the outer surfaces of the sarcoplasmic vesicles, but the vesicles remained empty. Deposits of 1,000-2,000 A diameter were confined mainly to the A-I junction, near the Z line. Advanced degeneration of the muscle tissue was observed, and was characterized by a lack of distinction between the A and I bands, disruption of the continuity of the myofibrils, the presence of some vacuoles, and localization of dense pyroantimonate granules near the Z lines. Similar, but less pronounced changes were also seen in the red muscle. Both the smaller and larger precipitates contained appreciable amounts of calcium. The ratio between the smaller and larger precipitates was 10:1 in the control muscle and 10:5 after 2,4-D treatment. The results suggest that 2,4-D treatment results in a change in the distribution of calcium between the triads and troponin C, leading to a long-lasting, and finally irreversible, activation of the actin-myosin system.

78-0166. Allen, J. R. ; Barsotti, D. A.; Lalich, J. J.; Van Miller, J. P.; Abrahamson, L. J. (Dept. Pathol., Univ. Wisconsin Med. Sch., Reg. Primate Res. Cent., Madison, WI 53706) **Morphological changes in monkeys consuming a diet containing low levels of 2,3,7,8-tetrachlorodibenzo -*p*- dioxin.** *Food Cosmet. Toxicol.* 15(5): 401-410; 1977. (8 references)

Female rhesus monkeys given a diet containing 500 ppt ($t = 10^{12}$) 2,3,7,8-tetrachlorodibenzo -*p*- dioxin (TCDD) for 9 months became anemic within 6 months and pancytopenic after 9 months of exposure. The marked thrombocytopenia was associated with widespread hemorrhage. Death occurred in five of the eight animals between months 7 and 12 of the experiment at total exposure levels of 2-3 μg TCDD kg body weight. At autopsy, in addition to the extensive hemorrhage, there was a distinct hypocellularity of the bone marrow and lymph nodes. Hypertrophy, hyperplasia and metaplasia of the epithelium in the bronchial tree, bile ducts, pancreatic ducts, salivary-gland ducts and palpebral conjunctivae were observed. Squamous metaplasia and keratinization of the sebaceous glands and hair follicles were present in the skin. Death was attributed to complications from the severe pancytopenia. (Author abstract by permission.)

78-0167. Brooks, G. T. (Agric. Res. Council, Unit Invertebrate Chem. Physiol., Univ. Sussex, Brighton, Sussex, England) **Epoxide hydratase as a modifier of biotransformation and biological activity.** *Gen. Pharmacol.* 8(4): 221-226; 1977. (36 references)

A study was made of epoxide hydratase as a modifier of biotransformation and biological activity. Specific topics discussed include the biochemistry of epoxide hydratase, the role of epoxide hydratase in selective toxicity, the role of epoxide hydratase in insecticidal action and insect resistance, and epoxide hydratase as a modifier of insect juvenile hormone activity.

78-0168. Koch, R. B. ; Desaiah, D.; Stinson, R.; Glick, B.; Subba Rao, D. S. V. (Dept. Biochem., Mississippi State Univ., Mississippi State, MS) **Antibody reactivation of kepone inhibited brain ATPase activities** *Gen. Pharmacol.* 8(4): 231-234; 1977. (18 references)

The antibody reactivation of kepone (chlordecone) inhibited brain ATPase activities was studied. Kelevan (a Kepone derivative) was covalently bound to bovine serum albumin (BSA) through a succinimide derivative, and rabbits were immunized by injection of the hapten-protein conjugate in an emulsion of Freund's complete adjuvant. Immunoglobulin fractions were prepared from control and immune rabbit serum, and immunoglobulin from BSA-Kel antiserum produced a complete reversal of Kepone inhibition of dog brain ATPase activities under the given experimental conditions. The results of this study indicate that in studies with the chlorinated hydrocarbon pesticides such as kepone and DCPD, one must be careful during tissue preparation to minimize possible reversal of ATPase inhibition.

78-0169. Turner, J. C. ; Green, R. S.; Kelly, W. J. (Wallaceville Animal Res. Cent., Res. Div., Ministry of Agr. and Fisheries, Upper Hutt, New Zealand) **The metabolism of foreign compounds by the sheep gastrointestinal tract in vitro.** *Gen. Pharmacol.* 8(4): 239-241; 1977. (19 references)

The ability of the sheep gastrointestinal tract to perform several common drug-metabolizing reactions was measured. Reactions studied were: epoxidation, *O*- and *N*-demethylation, hydroxylation, azo- and nitro-reduction, glucuronidation, *N*-acylation, *N*-deacetylation, hydrolysis, and glutathione conjugation. Cytochrome P-450 and cytochrome b_5 were also measured. The results of the study indicate that the gastrointestinal tract of the sheep has the ability to carry out many of the reactions associated with foreign

compound metabolism. In all regions of the tract examined, the majority of the reactions studied had measurable activity. Biphenyl hydroxylase and glycine *N*-acylase activities were too low to measure accurately.

78-0170. Reddy, G. ; Khan, M. A. Q. (Dept. Biol. Sci., Univ. Illinois, Chicago, IL) **Metabolism of (^{14}C) photoisodrin** in mice and houseflies. *Gen. Pharmacol.* 8(4): 285-289; 1977. (19 references)

The metabolism of C-14 labeled photoisodrin was studied in mice and houseflies. Both in vivo and in vitro studies were conducted. About 10 and 80% of the orally administered dose of photoisodrin in male mice was eliminated in the urine and feces, respectively, over 4 days following the treatment. About 4 and 74% of the activity in the urine and feces, respectively, was extractable with organic solvents. Five metabolites were found in the feces and one in the urine in addition to photoisodrin. Organic extracts of the aqueous phase after acid hydrolysis showed 4 metabolites in feces and 3 in urine. At autopsy, 4 days after treatment, all eleven tissues sampled showed a minimum of 0.02% of the administered dose. Higher concentrations were found in the fat, followed by the liver, and then by the other tissues studied. About 57% of the topically applied dose could be recovered from flies and the container after a period of 24 hours. The extracts of the flies and their excreta showed three metabolites along with photoisodrin. The in vitro metabolism of photoisodrin by the microsomal mixed-function oxidase produced 5 and 1 organosoluble metabolites in the case of mouse liver and housefly abdomens, respectively.

78-0171. Elizarova, O. N. ; Nuzhdina, D. P. (F. F. Erisman Moscow Sci. Res. Inst. Hyg. Moscow, USSR) **Metod otsenki izmeneniya sostoianiya nukleinovykh kislot v kletkakh odnosloinykh perevivaemykh kletochnykh kul'tur. [Method for the assessment of changes in the status of nucleic acids in transplantable monolayer cell cultures.]** *Gig. Sanit.* 6: 53-55; 1977. (5 references) (Russian)

A rapid microscopic method for assessing the toxicity of pesticides, based on the changes brought about in the status of the intracellular and intranuclear RNAs and DNAs in RH, MK and Fl monolayer cell cultures, is described. The toxicity of the pesticides was assessed by microscopic determination of the changes caused in the luminescence of the DNAs and RNAs and its distribution after exposure for 4-48 hr. A linear dose-effect relationship was observed. The pesticides caused a change in the luminescence of the nuclear DNAs from bright green to light green to greenish yellow and yellow, depending on their concentration. Part of the DNAs lost their luminescence under the influence of the pesticides. The luminescence of the cytoplasmic RNAs changed from bright red to dark red, and it was lost at high doses. The effect of the pesticides was assessed by microscopic examination of 200 cells in a four-score system on the basis of the percentage of cells with luminescence changes. Trichlorfon and zineb caused highly pronounced changes when applied in cytotoxic threshold doses; trichlorfon was effective even in doses that had been found ineffective in cytotoxicity tests. The changes were most pronounced in the RNAs. The findings indicate the high sensitivity of the monolayer method.

78-0172. Gupta, P. K. (Ind. Toxicol. Res. Cent., Lucknow, India) **Relative distribution of ^{32}P malathion in chick: degradation in feed.** *Ind. Health* 14(1-2): 21-24; 1976. (6 references)

A study was undertaken to find the residues in feed and the relative distribution of P-32 in different tissues of chicks fed with malathion-sprayed feed. The degradation of malathion after a period of 2 months in feed sprayed with 0.08% and 0.16% of 50% emulsifiable malathion was 63 and 64%, respectively. Thirty days was the half life. No signs of toxicity were noted in chicks fed with P-32 malathion. With lower dosage at 10 days, the concentration of P-32 was highest in the kidney, 10 ppm, followed by the liver at 9 ppm, blood at 8 ppm, heart and spleen at 5 ppm each, lung at 4 ppm, intestine at 3 ppm, muscle at 3 ppm, and bone, brain and testes at 2 ppm. P-32 was slightly increased in different organs with the lapse of time, and at 30 days, it was maximum in the liver, followed by other organs. With the highest dosage (800 ppm), the concentration of P-32 was correspondingly higher in various organs under study. When treatment was stopped, P-32 was abruptly decreased in all the organs, and at 10 days post-treatment liver and kidney had less than 1 ppm. No P-32 was detected in other organs after this time period.

78-0173. Aravindakshan, A. ; Chand, B.; Ramachandran, M.; Hussain, Q. Z. (Dept. Biochem., Natl. Inst. Communicable Dis., Delhi 110006, India) **Effect of dietary DDT on certain biochemical changes in albino rats.** *Indian J. Exp. Biol.* 15(7): 578-579; 1977. (9 references)

A study was conducted to determine whether prolonged feeding of DDT at levels comparable to the acceptable daily intake to albino rats over a period of 6 months would reveal any toxic disturbances as revealed by body stores of DDT and its metabolites and changes in the transaminase activity of serum and liver. Quantities of DDT fed ranged from 50 to 300 ppm. DDT fed rats had stored nearly 60 times more DDT than the unfed controls, but there was no significant change in the transaminase activity, ruling out the possibility of any liver dysfunction. It was concluded that the body stores of DDT were mainly derived from the food chain.

78-0174. Singh, B. D. ; Singh, Y.; Sarma, N. D. R. K.; Singh, R. B.; Singh, J.; Singh, R. M. (Dept. Genetics Plant Breeding, Fac. Agric., Banaras Hindu Univ., Varanasi, India) **Cytogenetic aberrations and morphological changes induced by insecticide treatments of barley seeds.** *Indian J. Exp. Biol.* 15(8): 688-691; 1977. (9 references)

Cytogenetic and morphological anomalies induced by 9 insecticides in barley (*Hordeum vulgare* L.) are reported in this communication. The insecticides used were: endrin, cythion (malathion), ambithion (fenitrothion plus malath-

ion), dimecran (phosphamidon), citrolane (mephosfalan), thimet (phorate), counter (terbufos), furadon (carbofuran), and disyston (disulfofon). Of these, three were nonsystemic, viz. endrin, cythion 20EC, and ambithion. In the study five hundred seeds of barley were treated with 0.02, 0.1 and 5% solutions of each of the 9 insecticides. Seedling height and pollen fertility were reduced significantly in the majority of treatments, but germination was reduced in 2 insecticide treatments only. At metaphase all the insecticides induced mainly chromosome fragments, occasionally nonorientation of chromosomes at metaphase, and at anaphase mainly chromatid bridges, and sometimes laggards, fragments, and bridges with fragments and/or laggards were seen in root tips.

78-0175. Abraham, S. ; Edery, H. (Israel Inst. for Biol. Res., Ness-Ziona Sch. Med., Tel Aviv, Israel) **Presynaptic effects of soman in rat isolated diaphragm.** *Israel J. Med. Sci.* 13(11): 1142-1143; 1977.

To asses the neuromuscular effects of soman in addition to or independent of cholinesterase (ChE) inhibition experiments were performed on isolated rat diaphragm preparations kept in Ringer's solution at 37°C. Total ChE inhibition in the diaphragm occurred within 5 min with 0.5 μM soman. Soman depolarized the muscle membrane including the surrounding endplate, depending on the K concentration of the medium. Transient increases in the frequency of miniature endplate potentials (mepp) were observed starting at 0.5 μM soman, which were blocked by increasing the Mg concentration in the medium. Soman at 0.5 and 5 μM increased quantal content while 50 μM decreased it. Initial acetylcholine output was 28 ± 8 ng/hemidiaphragm/20 min; gradually decreased in subsequent samples; and could be prevented by 0.5 μM soman. These results indicate a direct depolarizing effect of soman which is independent of ChE inhibition, but is probably dependent on normal function of the Na - K pump.

78-0176. Wingfield, G. I. ; Davies, H. A.; Greaves, M. P. (Agric. Res. Council, Weed Res. Organization, Begbroke Hill, Oxford, England) **The effect of soil treatment on the response of the soil microflora to the herbicide dalapon.** *J. Agric. Bacteriol.* 43(1): 39-46; 1977. (10 references)

Results that were obtained using three different methods of investigating some effects of a herbicide on soil microflora are described. One method used soil cores, where the soil is in a similar state to that in the field, while the others are representative of methods used in many labs. Dalapon, a herbicide applied for control of grass weeds at rates up to 40 kg/ha for total pasture destruction, was used in these experiments. The parameters examined were bacterial numbers and dehydrogenase activity. The effects of dalapon were less marked in soil cores sprayed with dalapon than in disturbed soil samples with herbicide incorporated throughout. Air-drying of soil reduced the rate of disappearance of dalapon. These results have implications in relation to the problems of designing sensitive tests which avoid exaggerated or abnormal effects of the agricultural chemical under test.

78-0177. Bristol, D. W. ; Ghanuni, A. M.; Oleson, A. E. (Dept. Biochem., N. Dak. State Univ., Fargo, ND 58102) **Metabolism of 2,4-dichlorophenoxyacetic acid by wheat cell suspension cultures.** *J. Agric. Food Chem.* 25(6): 1308-1314; 1977. (26 references)

Wheat cells in suspension culture absorbed [*acetic* -2-C14] 2,4-dichlorophenoxyacetic acid ([*acetic*-2-C14] 2,4-D) rapidly from B5 nutrient medium. After 4 days of incubation, the distribution of radiolabel in the culture system reached a steady state. After 6 to 8 days, the major metabolism pathway for 2,4-D involved ring hydroxylation followed by conjugation with sugars since over 37% of the applied radiolabel was present in the cells as water-soluble/ether-insoluble metabolites. Following hydrolysis, extraction into ether, and separation by TLC, 4-hydroxy -2,5- dichlorophenoxyacetic acid was identified as the major aglycon present. Lesser amounts of 4-hydroxy -2,3- dichlorophenoxyacetic acid, and free 2,4-D present in the cells after 6 to 8 days represented only 17 and 13%, respectively, of the applied radiolabel. A considerable amount (12%) of the applied radiolabel was bound to insoluble cellular tissue while 10% was present in the extracellular medium. By difference, apparently 9.4% was lost from the system as a volatile metabolite. The results of this model study are compared with those reported for other plants in tissue culture and support the hypothesis that the resistance of some plants to the herbicidal action of 2,4-D is related to their species specific ability to accomplish detoxification by conversion to water-soluble metabolites. (Author abstract reprinted by permission of the American Chemical Society.)

78-0178. Smrek, A. L. ; Adams, S. R.; Liddle, J. A.; Kimbrough, R. D. (Toxicol. Branch, Bur. Lab., Cent. Dis. Control, Atlanta, GA 30333) **Pharmacokinetics of mirex in goats. I. Effect of reproduction and lactation.** *J. Agric. Food Chem.* 25(6): 1321-1325; 1977. (17 references)

Groups of five male and five female goats were given 0 and 1 mg of mirex/kg of body weight daily for 61 weeks. An additional group of female goats was given 1 mg of mirex/kg of body weight daily for 18 weeks. The female goats were given daily doses of 10 mg of mirex/kg of body weight for an additional 4 weeks after the exposures to 1 mg of mirex/kg of body weight for 61 and 18 weeks. Goats exposed 61 weeks were bred twice and those exposed 18 weeks were bred once. Plasma, milk, and adipose tissue were analyzed for mirex at intervals. Adipose tissue levels of mirex were lower in female than in male goats and were not noticeably affected by pregnancy. A steady mirex concentration was not reached in adipose tissue, whereas the plasma levels became stationary after about 5 months of exposure. (Author abstract reprinted by permission of the American Chemical Society.)

78-0179. Dishburger, H. J. ; McKellar, R. L.; Pennington, J. Y.; Rice, J. R. (Agric. Prod. Dep., Dow Chem. Co., Midland, MI 48640) **Determination of residues of chlorpyrifos, its oxygen analogue, and 3,5,6-trichloro -2- pyridinol in tissues of cattle fed chlorpyrifos.** *J. Agric. Food Chem.* 25(6): 1325-1329; 1977. (8 references)

Cattle were fed chlorpyrifos daily for 30 days at levels of 3, 10, 30, and 100 ppm. Muscle, liver, kidney, omental fat, renal fat, and subcutaneous fat were collected at the end of this period. In addition, omental fat was collected by biopsy at weekly intervals for 5 weeks following withdrawal of the highest level of 100 ppm chlorpyrifos. Residues of chlorpyrifos and its oxygen analogue were determined by thermionic or flame photometric gas chromatography. The 3,5,6-trichloro -2- pyridinol moiety as the trimethylsilyl derivative was determined by electron-capture gas chromatography. The procedures were used to quantitate chlorpyrifos and its oxygen analogue down to 0.01 ppm and 3,5,6-trichloro -2-pyridinol to 0.05 ppm. Residues of chlorpyrifos were mainly in the fat tissues and averaged 0.02 ppm (< 0.01-0.05 ppm) with 3 ppm in the diet and 3.28 ppm (2.28-4.70 ppm) in fat of cattle fed 100 ppm. The 3,5,6-trichloro -2- pyridinol was predominantly in the liver and kidney and averaged 0.20 ppm (0.16-0.23 ppm) in liver and 0.11 ppm (0.09-0.15 ppm) in kidney at 3 ppm; 2.41 ppm (2.16-2.61 ppm) in liver and 1.75pppm (1.46-1.95 ppm) in kidney at the 100 ppm feeding level. No chlorpyrifos oxygen analogue was detected in any tissue at any feeding level. (Author abstract reprinted by permission of the American Chemical Society.)

78-0180. Ou, L. T. ; Sikka, H. C. (Dept. Soil Sci., Univ. Florida, Gainesville, FL 32601) **Extensive degradation of silvex by synergistic action of aquatic microorganisms.** *J. Agric. Food Chem.* 25(6): 1336-1339; 1977. (18 references)

The herbicide 2-(2,4,5-trichlorophenoxy) propionic acid (silvex) was extensively degraded by a mixed culture of a *Pseudomonas* species and an *Achromobacter* species isolated from farm pond water. Neither of the two organisms separately was able to metabolize the herbicide. In the degradation of silvex by the mixed culture, chlorine was liberated from the herbicide, the aromatic ring was cleaved, and CO_2 was evolved. Except for a minor amount of 2,4,5-trichlorophenol, no silvex metabolites as detected by TLC were found. The mixed culture also readily decomposed 2,4,-5-trichlorophenol and 3,5-dichlorocatechol. (Author abstract reprinted by permission of the American Chemical Society.)

78-0181. Adler, I. L. ; Jones, B. M.; Wargo, J. P., Jr. (Rohm and Haas Co., Res. Lab., Spring House, PA 19477) **Fate of 2-chloro -2- (3-ethoxy -4-nitrophenoxy)- 4-(trifluoromethyl) benzene (oxyfluorofen) in rats.** *J. Agric. Food Chem.* 25(6): 1339-1341; 1977. (10 references)

Two albino rats were dosed orally with [C14]trifluoromethyl-labeled 2-chloro -1- (3-ethoxy-4-nitrophenoxy) -4- (trifluoromethyl)benzene for 7 consecutive days. Only trace amounts of radioactivity (2-4%) were recovered in the urine and tissues. The major route of dose elimination was through the feces (approx 95%). About 75% of the fecal radioactivity was the unchanged dosed compound. Other compounds present in feces were: 5-(2-chloro -4- (trifluoromethyl)phenoxy] -2- nitrophenol, 4-[2-chloro -4- (trifluoromethyl)phenoxy] -2- ethoxybenzenamine, *N*-[4-[2-chloro -4- (trifluoromethyl)phenoxy] -2- ethoxyphenyl]acetamide, and *N*-[4-[2-chloro -4- (trifluoromethyl)phenoxy] -2-hydroxyphenyl]acetamide. (Author abstract reprinted by permission of the American Chemical Society.)

78-0182. Bradway, D. E. ; Shafik, T. M. (Health Effects Res. Lab., U.S. Environ. Prot. Agency, Res. Triangle Park, NC 27711) **Malathion exposure studies. Determination of mono- and dicarboxylic acids and alkyl phosphates in urine.** *J. Agric. Food Chem.* 25(6): 1342-1344; 1977. (10 references)

A method for the analysis of the dialkyl phosphate metabolites of organophosphorus pesticides was modified to permit analysis of the monocarboxylic acid (MCA) and dicarboxylic acid (DCA) metabolites of malathion. Recoveries of MCA and DCA from spiked urine are presented, as well as the results of analyses of urine from rats exposed to malathion at five levels. Data from both exposed and unexposed humans are presented. (Author abstract reprinted by permission of the American Chemical Society.)

78-0183. Bradway, D. E. ; Shafik, T. M.; Lores, E. M. (Anal. Chem. Branch, Environ. Toxicol. Div., Health Effects Res. Lab., U.S. Environ. Prot. Agency, Res. Triangle Park, NC 27711) **Comparison of cholinesterase activity, residue levels, and urinary metabolite excretion of rats exposed to organophosphorus pesticides.** *J. Agric. Food Chem.* 25(6): 1353-1358; 1977. (6 references)

Blood cholinesterase activity, urinary levels of phenolic and organophosphorus metabolites, and residues of intact compounds in blood and fat were determined following exposure of rats to organophosphorus pesticides. The eight pesticides studied included representative halogenated compounds (carbophenothion, dichlofenthion, ronnel, and leptophos) and nonhalogenated compounds (parathion, EPN, dimethoate, and dichlorvos). Cholinesterase activity was determined by gas chromatography. Metabolites were extracted, derivatized, subjected to silica gel chromatography, and quantitated by FP-GC and EC-GC. Residues were extracted, cleaned up with silica gel chromatography, and quantitated with EC-GC. Data comparing these various exposure indicators are presented. (Author abstract reprinted by permission of the American Chemical Society.)

78-0184. Turner, W. V. ; Engel, J. L.; Casida, J. E. (Pestic. Chem. Toxicol. Lab., Dept. Entomol. Sci., Univ. Calif., Berkeley, CA 94720) **Toxaphene components and related compounds: preparation and toxicity of some hepta-, octa-, and nonachlorobornanes, hexa- and heptachlorobornenes, and a hexachlorobornadiene.** *J. Agric. Food Chem.* 25(6): 1394-1401; 1977. (20 references)

Five major toxaphene components [2,2,5-endo,6-exo,8,9,10- heptachlorobornane (B) and its 3-exo-chloro, 8-chloro, 9-chloro, and 10-chloro derivatives] collectively account for up to 23% of the GLC-electron-capture properties of chlorinated technical grade camphene (i.e., toxaphene insecticide) and up to 34% of those of chlorinated 2-exo,10-dichlorobornane. Chlorination of 2-exo,10-dichlorobornane

provides a convenient source of B, which on further chlorination gives the indicated octachlorobornanes and the 5-exo-chloro derivative of B plus two nonachlorobornanes, one with the introduced chlorines at C-8 and C-10 and the other with these chlorines at the 3-exo position and at C-10. On dehydrochlorination B yields two hexachlorobornenes and the 3-exo-chloro derivative of B gives one heptachlorobornene and one hexachlorobornadiene. The toxicity to mice, houseflies, and goldfish of the octachlorobornanes formed by introducing chlorine substituents into B, relative to B itself, generally decreases in the order: 9-chloro > 8-chloro > no added chlorine (i.e., B) > 3-exo-chloro, 5-exo-chloro, or 10-chloro. (Author abstract reprinted by permission of the American Chemical Society.)

78-0185. Katan, J. ; Lichtenstein, E. P. (Hebrew Univ., Fac. Agric., Rehovot, Israel) **Mechanisms of production of soil-bound residues of [^{14}C] parathion by microorganisms.** *J. Agric. Food Chem.* 25(6): 1404-1408; 1977. (18 references)

Unextractable (bound) radiolabeled residues are formed when [C14]parathion is incubated in soil. The role of microorganisms in producing these bound residues was investigated by incubating [ring-C14]-parathion in soil-free culture media that had been inoculated with soil microorganisms. The amounts of compounds in culture supernatants, that upon addition to soil became unextractable, increased up to 12 hr of microbial culture incubation, when 43% of the added radiocarbon was bound after a 2 hr soil incubation period. The increase in soil bound residues was correlated with a decrease in the amount of parathion in the microbial culture and a concomitant increase in the appearance of the major degradation product, aminoparathion. Microbial cells contained only a minor proportion of C14-bound residues. Addition of natural microbial growth metabolites to the soil did not affect binding of either parathion or aminoparathion. This latter compound was highly bound to both sterile and nonsterile soils. When [C14]parathion, [C14]paraoxon, *p*-[C14]nitrophenol, and their respective C14-amino compounds were added to soil, the amino compounds were bound to a much greater extent than were the nitro compounds. It appears that the process of parathion degradation has to be separated from that of binding and that the role of the microorganisms in soil binding phenomena consisted in degrading [C14] parathion to compounds which are more tightly bound to soil than the parent insecticide. Once these compounds were formed, their binding to soil was found to be high. (Author abstract reprinted by permission of the American Chemical Society.)

See also **78-0012** **78-0182**

78-0186. Paschal, D. C. ; Bicknell, R.; Dresbach, D. (Dept. Chem., Illinois State Univ., Normal, IL 61761) **Determination of ethyl and methyl parathion in runoff water with high performance liquid chromatography.** *Anal. Chem.* 49(11): 1551-1554; 1977. (12 references)

High performance liquid chromatography with variable wavelength detection is described for the determination of methyl and ethyl parathion at the part per billion level in runoff water. The macroreticular resin XAD-2 was used as an adsorption medium for preconcentration of trace organics in water by a factor of 100. Linear relationships between peak height or area and concentration were obtained in the range 0 to 120 ppb of methyl and ethyl parathion, with a lower detection limit of 2 to 3 ppb (S/N = 2). Relative standard deviations in this range were 1 to 6%, with an average recovery of 99%. Only 30 min is required for the complete determination, and as little as 2 ng of methyl or ethyl parathion can be quantified with a 10-μL injection. (Author abstract reprinted by permission of the American Chemical Society)

78-0187. Lewis, R. G. ; Brown, A. R.; Jackson, M. D. (U. S. EPA, Health Effects Res. Lab., Research Triangle Park, NC 27711) **Evaluation of polyurethane foam for sampling of pesticides, polychlorinated biphenyls and polychlorinated naphthalenes in ambient air.** *Anal. Chem.* 49(12): 1668-1672; 1977. (14 references)

Polyurethane foam has been evaluated for use in a high-volume air sampler to collect a broad spectrum of pesticides, polychlorinated biphenyls (PCBs) and polychlorinated naphthalenes (PCNs). The sampler draws air through a glass module equipped with a particulate filter and a polyurethane foam vapor trap at flow rates which can be controlled from 100 to 250 L/min. Up to 360 m^3 of air can be sampled in a 24-h day, providing theoretical detection limits of less than 0.1 ng/m^3 for some individual compounds. Extraction and clean-up methodology for gas chromatographic analysis are uncomplicated. Collection efficiencies have been determined for several organochlorine and organophosphate pesticides, PCBs and PCNs. (Author abstract reprinted by permission of the American Chemical Society)

78-0188. Preston, J. M. ; Karasek, F. W.; Kim, S. H. (Defense Res. Establishment Ottawa, Natl. Defense Headquarters, Ottawa, Ontario, Canada K1A OZ4) **Plasma chromatography of phosphorus esters.** *Anal. Chem.* 49(12): 1746-1750; 1977. (13 references)

Mobility and diffusion coefficients, in air, of 47 ions formed by atmospheric ionic reactions of 16 phosphorus esters and thioesters are reported. Very careful assignment of ions to the peaks of the mobility spectra produced considerable confidence in these assignments. With some compounds, asymmetric peaks indicative of limited hydration reactions were noted. (Author abstract reprinted by permission of the American Chemical Society).

78-0189. Rus, V. ; Funduc, I.; Crainiceanu, A.; Trestianu, S. (Research Center for Physical Chemistry, Bucharest, Romania) **Gas chromatographic column for separation of organochlorine insecticide residues** *Anal. Chem.* 49(13): 2123-2124; 1977. (8 references)

Fourteen organochlorine insecticides residues taken from various plant and vegetable products were separated using pre-mixed stationary phase solutions. Packing consisted of 2.5% OV-11 + 1% QF-1 + 0.5% XE-60 on Chromosorb W HP 100-120 mesh prepared by premixing the stationary phase solutions in benzene and impregnating the support by the pan coating method. Tests were run on a Carlo Erba Fractovap Model 2301 with ^{63}Ni electron capture detector. Components were separated in 19 mintues. Detection limits ranged from 0.5 pg for hexachlorobenzene to 20 pg for *p,p'* -DDT.

78-0190. Smyth, M. R. ; Osteryoung, J. G. (Dep. Microbiol., Col. State Univ., Fort Collins, CO 80523) **Determination of some thiourea-containing pesticides by pulse voltammetric methods of analysis.** *Anal. Chem.* 49(14): 2310-2314; 1977. (31 references)

The polarographic behavior of thiourea, phenylthiourea, α-naphthylthiourea and benzyl(iso)thiourea has been investigated In Britton-Robinson buffer and sodium hydroxide solutions. The waves obtained for these compounds in 1 M NaOH are recommended for analytical purposes. In particular, differential pulse polarography has been used to resolve a mixture containing thiourea, phenylthiourea or α -naphthylthiourea and benzyl(iso)thiourea. This technique can be used to determine concentrations of thiourea and phenylthiourea down to 0.1 μM, α-naphthylthiourea down to 0.2 μM and benzyl(iso)thiourea down to 0.5 μM under optimum conditions. Since thiourea, phenyylthiourea, and α-naphthylthiourea form insoluble complexes with mercury, these compounds can also be determined by cathodic stripped voltammetry at a hanging mercury drop electrode. This method of analysis can determine concentrations of these compounds down to 1 ng/mL and has been applied to the direct determination of thiourea in urine. (Author abstract reprinted by permission of the American Chemical Society)

78-0191. Ragab, M. T. H. (Agric. Canada, Res. Station, Kentville, Nova Scotia, Canada) **Direct electron capture gas chromatography of 2,3-dihydro -2,2- dimethyl -3- oxo-7-benzofuranyl *N*-methylcarbamate; a metabolite of carbofuran insecticide.** *Anal. Lett.* 10(7-8): 551-564; 1977. (19 references)

An electron capture gas chromatographic method was developed for the direct quantitative determination of 3-oxocarbofuran (2,3-dihydro- 2,2-dimethyl- 3-oxo-7-benzofuranyl *N*-methylcarbamate). A U-shaped glass column (36 x 0.64 cm o.d.) packed with 3% OV-210 on Gas-chrom Q 100/120 mesh was used. The column was conditioned at 225°C for 48 hr before connecting to the detector. The column, injector, and detector temperatures were 155°C, 200° C, and 275°C, respectively, and the carrier and purge gas (argon containing 5% methane) pressure was 40 PSI. The column was conditioned by injecting it with a concentrated

standard until reproducible results were obtained. The ^{63}Ni electron-capture response for 3-oxocarbofuran over the range 0.1-3.0 ng was linear when peak height was plotted against amount injected. For a 50% full-scale deflection, about 1.5 ng of 3-oxocarbofuran was required. The retention times of 3-oxocarbofuran relative to aldrin and lindane were 1.90 and 2.40, respectively. Standards of carbofuran could not be detected ans 10 ng of 3-hydroxycarbofuran produced only a small peak at a retention time of 1.17 relative to 3-oxocarbofuran. Quantities as low as 1 ppb 3-oxocarbofuran in water were detectable. The method is rapid, conventient, and does not require the formation of a derivative.

78-0192. Bagnoux, H. ; Pepin, D.; Chabard, J. L.; Vedrine, F.; Petit, J.; Berger, J. A. (Lab. Chim. Anal., Fac. Pharm., F63001 Clermont-Ferrand, France) **Chromatographic study for the comparison of several concentration and extraction procedures of pesticide residues in waters: application to two organophosphorothioate pesticides, parathion and malathion.** *Analusis* 5(4): 170-177; 1977. (30 references) (French)

Improved methods for the extraction of phosphorus and sulfur pesticide residues and their degradation products, from water are presented. Two low temperature preconcentration methods, lyophilization and cryoconcentration, were used. After concentration, two organophosphorothioate pesticides (parathion and malathion) were analyzed qualitatively and quantatively analyzed by TLC, and GLC with flame photometry. The results obtained were as good as or better than those obtained with the Mestres extraction method. The advantages of lyophilization and cryocentration are discussed.

78-0193. Caverly, J. D. ; Denney, R. C. (Ministry of Agric. Fish. Food, Wye, Ashford, Kent TN25 5KL, England) **Determination of residues of the herbicides bromacil, lenacil, and terbacil in soils by gas chromatography.** *Analyst (London)* 102(1217): 576-579; 1977. (11 references)

A rapid and sensitive procedure for the determination of residue levels of three uracil herbicides in soils is described. After addition of calcium hydroxide and Celite to the soil the herbicides are eluted from columns with water. After acidification of the eluate and partition into chloroform these herbicides are determined by gas chromatography using a nitrogen-selective detector. Recoveries from a range of soil types are better than 80%, with a sensitivity limit of 20 μ g/kg. (Author abstract by permission)

78-0194. Garrison, A. W. (Environmental Research Laboratory, United States Environmental Protection Agency, Athens, GA 30601) **Analysis of organic compounds in water to support health effects studies.** *Ann. NY Acad. Sci.* 298: 2-19; 1977. (25 references)

Organic compounds in water are becoming of greater concern to environmentalists and health officials, but no systematic effort has yet been made to collect an extensive data bank on the nature and effects of these compounds. About 5% of the organic compounds found in water exist as volatile compounds, easily analyzed and recognized by gas-chromatographic and mass spectrometry methods. Most pollution surveys center around these volatile compounds. These compounds have been identified in New Orleans drinking water, Miami drinking water, and many other industrial and municipal waters. The remaining 95% of the organic compounds found in water are of a non-volatile nature, and little research has been done on these compounds. Many compounds have been reported only once or twice, and no further work was then done on the nature of the compound and its possible effects. It is suggested that work continue with the volatile organics, including establishment of a data bank for known substances, development of uniform analytical methods, and improvement of existing techniques. Development of easy analytical procedures for the non-volatile compounds is also suggested. Method for sediment and colloidal solid analysis and systematic classifications for all organic compounds are indicated as areas of further study. Pesticides are frequently recognized as water pollutants because their analytical characteristics are well documented.

78-0195. Camoni, I. ; Chiacchierini, E.; Di Domenico, A.; Iachetta, R.; Magri, A. L. (Inst. Super. San., Lab. Chim., Rome, Italy) **Gas-liquid chromatography analysis of bioresmethrin.** *Ann. Chim.* 66(7-8): 439-446; 1976.

A rapid, specific gas chromatographic method for the determination of bioresmethrin (BR) is described. The method is based on direct analysis of BR by gas-liquid chromatography, and is valid when BR is present either alone or mixed with bioallethrin. If piperonyl butoxide is present in the sample, the BR solution can be quantitatively converted to 2-benzyl-4- hydroxymethylfuran by alkaline hhydrolysis of the mixture and then run on GLC. A gas chromatography fitted with either a flame ionization or electron capture detector was used. The identities of the compounds tested were confirmed by NMR and mass spectroscopy. Five different stationary phases were used in the GLC, all with satisfactory results. This method was tested on fish treated with known amounts of BR. Recoveries of 83, 82, 85, 80, and 75% were obtained from fish treated with 5.0, 4.0, 3.0, 2.0, and 1.0 ppm BR, respectively.

78-0196. Khan, S. U. (Chem. Biol. Res. Inst. Canada Agric., Ottawa, Ontario Canada K1A OC6) **Determination of terbacil in soil by gas-liquid chromatography with ^{63}Ni electron capture detection.** *Bull. Environ. Contam. Toxicol.* 18(1): 83-88; 1977. (3 references)

A method for the determination of terbacil residues in soil is presented. Herbicide residues are extracted from the soil with 1.5% NaOH, partitioned into an organic phase, and purified on a Florisil column. The extract is then analyzed with GLC using a ^{63}Ni electron capture detector. Replicate assays were performed on Fox sandy loam, Bookton sandy loam, and Bookton loam treated annually with terbacil at 4.5 kg/ha. The values of terbacil residues in these soils were 2.53 0.06, 1.47 0.09, and 0.49 0.07 ppm, respectively. Based on 20 g samples, this method has a sensitivity of approximately 0.01 ppm.

78-0197. Burkart, J. A. ; Takade, D. Y.; Potter, R. (Utah Biomed. Test Lab., 520 Wakara Way, Salt Lake City, UT 84108) **Estimates of variability in a comparative standardized cholinesterase assay.** *Bull. Environ. Contam. Toxicol.* 18(1): 89-95; 1977. (9 references)

The results of a statistical study are presented which attempt to ascertain day to day variability in two laboratories using five commercially available cholinesterase controls, thereby eliminating within-subject variability arising from repeated sampling of a subject. Five control samples were divided into 20 lots, and each laboratory performed cholinesterase determinations for the five samples on each of 10 different days. Identical protocols, procedures, and reagents were used. Mean cholinesterase values were reported as optical density (OD) values. The standard error for comparing the sample in the same lab on a different day was 0.040 OD units. The difference between daily measurements in the same laboratory would have to be more than 0.080 OD units (about 20% on the average) for that difference to be statistically significant at the 5% level. This study demonstrates that cholinesterase determinations on control sera are very imprecise so that only large real differences in cholinesterase values are detectable.

78-0198. Rouchaud, J. P. (Univ. Catholique de Louvain, Lab. Phytopathol., Louvain-la-Neuve, Belgium) **Analysis of piperazine, of the piperazine generating fungicide triforine, and triforine's metabolites in barley plants.** *Bull. Environ. Contam. Toxicol.* 18(2): 184-189; 1977. (7 references)

Methods were developed for measuring the total amount of piperazine-containing compounds in triforine-treated barley plants and for analyzing and identifying triforine and its metabolites in these plants. Samples of fortified barley plants were extracted with chloroform and then with hydrochloric acid. The resulting chloroform concentrate is dried, distilled with sulfuric acid, mixed with sodium chloride, shaken with ethyl formate, dried with calcium chloride, and analyzed by gas chromatography. The analysis measures chloral, two moles of which corresponds to one mole of the piperazine-containing compound. The hydrochloric acid concentrate resulting from the preliminary extraction is dissolved in hydrochloric acid, mixed with aqueous sodium hydroxide, freeze dried, and the residue shaken with aqueous sodium chloride and chloroform. The chloroform phase is analyzed by gas chromatography for piperazine, one mole of which corresponds to one mole of the piperazine-containing ring. The solid residue is heated with hydrochloric acid, mixed with sodium hydroxide, freeze dried, and the residue analyzed by gas chromatography for piperazine, one mole of which corresponds to one mole of the compound containing the piperazine ring. This procedure allows the specific analysis of triforine and its two metabolites, TF/2 (*N*-(1-formamido-2,2,2- trichloroethyl)-piperazine) and piperazine. The chromatographic sensitivities are 0.03 ppm for piperazine and 0.01 ppm for chloral.

78-0199. McLean, H. R. ; Futagaki, S.; Leffingwell, J. T. (Univ. California, Sch. Public Health, Berkeley, CA) **Loss of paraoxon in aqueous acetonitrile extractions.** *Bull. Environ. Contam. Toxicol.* 18(2): 247-250; 1977. (12 references)

In a study of the effects of weathered foliar parathion residues on fieldworkers, data on residue penetration of clothing were required. Parathion was extracted from samples of five fabric types using benzene or acetonitrile then partitioned from the extract after dilution with water. The extracted samples were analyzed for parathion and paraoxon using flame photometric gas chromatography. The benzene extraction procedure provided reasonable efficiency, reproducibility, and ease of execution. The direct acetonitrile extraction was quantitative for both parathion and paraoxon, but when the residue was partitioned into hexane after the addition of water, only the parathion was recovered in high yield. The difference in extraction behavior was due to the relatively high water solubility of paraoxon relative to parathion. To avoid erroneous results and improper conclusions, care must be taken to avoid extraction procedures utilizing the partitioning of the extracted residues between aqueous acetonitrile and a hydrocarbon solvent, such as hexane or petroleum ether.

78-0200. Chambers, J. ; Matthews, W. A. (Pest Infestation Control Lab., Ministry Agr., Fisheries Food, Berks, England) **A simple method for the preparation of desmethyl derivatives of some organophosphorus insecticides.** *Bull. Environ. Contam. Toxicol.* 18(3): 326-330; 1977. (7 references)

Desmethyl derivatives of a variety of *O*-aryl-*O* , *O*"-dimethyl phosphorothionate compounds were prepared from the parent insecticides by treatment with potassium bromide. A stream of nitrogen bubbled through the reaction mixture was effective in removing the methyl iodide formed, thereby preventing isomerization of the desmethyl derivative to the isodesmethyl compound and enabling the pure desemethyl compound to be readily isolated. Potassium bromide was more effective in these reactions than was sodium iodide, although the yields even with potassium bromide were low. Iodofenphos reacted under the conditions used for bromophos (60°C for 16 hr), chlorpyrifos was successfully demethylated under milder conditions (40 C for 72 hr), and fenitrothion was demethylated in dimethylformamide- glycerol solution. The proposed procedure is advantageous in that the starting materials are cheep and readily available, the reaction is clean and simple, and the procedure does not involve malodorous compounds.

78-0201. Szokolay, A. (Nat. Inst. Hyg., 801 00 Bratislava, Czechoslovakia) **Rezidua chlorvanych insekticidov a zivotne prostredie v CSSR. [Residues of organochlorine insecticides in the environment in Czechoslovakia.]** *Cesk. Hyg.* 20(8): 353-358; 1975. (19 references) (Slovak)

General methodologica aspects of the determination of organochlorine pesticide residues in soil, drinking-water, fodder, potatoes, eggs, butter, mother's milk, and the daily diet are presented. Petroleum ether is recommended for extraction from soil, potatoes, animal feed, and from the daily diet. Acetone and petroleum ether should be used for eggs. It is possible to separate 13 organochlorine insecticides on a

Silufol plate in a thin-layer chromatographic procedure. Gas chromatography is used to separate BHC from DDT and its metabolites. The standard deviation of the gas-chromatographic determination is 0.17 mg/kg and the recovery rate is 85.6-98.5%.

78-0202. Kurzawa, Z. ; Krzyminska, A. (Inst. Gen. Chem., Politechnika, Poznan, Poland) **Determination of microgramme amounts of *N*-monoalkyldithiocarbamates by inducing sodium azide-iodine reaction.** *Chem. Anal. (Warsaw)* 22(4): 671-681; 1977. (15 references)

The determination of microgram amounts of *N*-monoalkyldithiocarbamtes by inducing sodium azide-iodine reactions was investigated. The sensitivity of the reaction is measured in terms of the coefficient of induction, which under suitable experimental conditions amounts to 175-196 depending on the nature of the substitutent on the nitrogen atom in the DTC molecule. The concentration range suitable for the determination of *N*-monoalkyl-DTC is 5-150 μg per 50 cm^3 of the solution. The error of the determination does not exceed 3%. Under suitable experimental conditions it is also possible to determine the sum of *N*-monoalkyl-DTC in a mixture. Individual compounds were determined after their separation by high voltage paper electrophoresis. The error of the determination was 3.5%. The products of deactivation of *N*-monoalkyl-DTC, the inducers of the reaction, have been examined. Sulfates and respective amines turned out to be the deactivation products. A proposed is a mechanism for the induced reaction.

78-0203. Kostowska, B. ; Witek, S.; Sadowski, J. (Dept. Ecol. Weed Control, Inst. Cultivation, Fertilization and Soil Sci., Warsaw, Poland.) **Oznaczanie pozostalosci mieszanek chwastobojczych zawierajacych 2,4-D I. Wybor pochodnej. [Determination of residues of weed killing mixtures containing 2,4-D. I. Selection of derivative.]** *Chem. Anal. (Warsaw)* 22(4): 711-716; 1977. (12 references) (Polish)

A study was made of the residues of weed killing mixtures containing 2,4-D. Mixtures of 2,4-D with dicamba, dichlorprop or mecoprop were used in the investigation. The purpose of the study was to establish a method for simultaneous determination of the mixture components. The study was conducted using GLC-ECD methods. Methyl esters, 2-chloroethyl esters as well as methyl esters of bromo- and nitroderivatives of analyzed herbicides were studied, and the most favorable conditions of chromatography and limits of detection are pointed out. The 2-chloroethyl esters were the most suitable for determinations. These derivatives allow the mixtures of 2,4-D with each other or the investigated herbicides to be analyzed with low detection limits in the range of 0.9 to 15.0 ng.

78-0204. Kostowska, B. ; Witek, S.; Sadowski, J. (Dept. Ecol., Weed Control, Inst. Cultivation, Fertilization and Soil Sci., Warsaw, Poland) **Dznaczanie pozostalosci mieszanek chwastobojczych zawierajcych 2,4-D. II. Metoda oznaczania pozostalosci w glebie oraz slomie i ziarnie zboz. [Determination of residues of weed killing mixtures containing 2,4-D. II. Method for residues analysis in soil, straw and grain of crops.]** *Chem. Anal. (Warsaw)* 22(4): 717-723; 1977. (5 references) (Polish)

Determination of residues of weed killing mixtures containing 2,4-D was studied. The method of simultaneous residue determinations of the mixtures was applied to soil as well as to straw and grain of crops. The mixtures studied included 2,4-D with dicamba, with dichlorprop, and with mecoprop. Residue was extracted from biological material with a mixture of isopropanol, water and 5 *N* phosphoric acid or alternatively with ethanol-water-5 *N* sulfuric acid. Extracts were purified with phosphate buffer at a pH of 6.2 and then evaporated to dryness. The dry residue was dissolved in concentrated sulfuric acid, cold 2-chloroethanol was then added and, after 10-15 minutes, *n*-hexane was added and the whole mixture shaken with a 10% solution of sodium sulfate. Some of the hexane layer was introduced into chromatography. The average recovery of determined herbicides is as follows: for grain 70-72.3%, for straw 72.7-74.2%, and for soil 83.5-87.6%. The detection limits in ppm for specified quantities of biological material are: for 2,4-D 0.004, for dicamba 0.008, for mecoprop 0.08, and for dichlorprop 0.002.

78-0205. Albro, P. W. ; Carbett, B. J. (Nat'l. Inst. Environ. Health Sci., Nat'l Inst. Health, Research Triangle Park, NC 27709) **Extraction and clean-up of animal tissues for subsequent determination of mixtures of chlorinated dibenzo-*p*-dioxins and dibenzofurans.** *Chemosphere* 6(7): 381-385; 1977. (7 references)

A procedure is described for the separation of chlorinated dibenzo-*p*-dioxins and dibenzofurans from lipids and chlorinated pesticides. Chloroform:methanol, 2:1, is used for extraction from liver and similar tissues, and the Kates procedure is used for extraction from blood, urine, milk, and serum; the chloroform paste resulting from these extractions is concentrated using a rotary evaporator. Adipose tissue is ground with anhydrous sodium sulfate and extracted with chloroform in a Soxhlet extractor. Preliminary clean-up involves leaching with CCL_4, partitioning against concentrated sulfuric acid, and passage of the CCl_4 layer through anhydrous Na_2CO_3. The resulting filtrate is concentrated and leached into *n*-hexane:methylene chloride, 97:3. The sample is then loaded onto a dry-packed column of Fisher A-540 alumina and eluted with *n*-hexane:methylene chloride. This procedure allows 100 2% recovery of dibenzodioxins and dibenzofurans. The final product from the procedure is suitable for analysis in the ppt tissue level by GC-mass spectrometry in both the electron impact and negative ion chemical ionization modes.

78-0206. Ragab, M. T. H. ; Kimball, E. R.; Chaisson, C. A. (Agriculture Canada, Research Station, Kentville, Nova Scotia, Canada) **Direct electron capture gas chromatographic determination of 3-oxocarbofuran in soil.** *Chemosphere* 6(8): 487-494; 1977. (16 references)

Carbofuran (2,3-dihydro- 2,2-dimethyl- 7-benzofuranyl *N*-methyl-carbamate), an insecticide used against soil inhabiting pests, degrades into several compounds. Between 5 and 10% of the carbofuran is converted to 3-oxocarbofuran. Electron capture gas chromatography has been shown to be a suitable method of analysis for 3-oxocarbofuran. A sample of air dried soil was extracted using Cook's procedure. Hydrochloric acid was added, and the sample mixture was refluxed and filtered. The filtrate, after standing, was extracted using multiple additions of methyl chloride, and then dried through sodium sulfate. The volume of the extract was reduced. Benzene was added, and the volume was reduced further. After dilution with hexane, the 3-oxocarbofuran samples were analyzed by electron capture gas chromatography using a glass column packed with 3% OV-210 on Gas-Chrom Q 100/120 at 155°C. As little as 0.1 ppm of 3-oxocarbofuran was detectable without additional treatment of the sample.

78-0207. Safe, S. ; Plugge, H. (Guelph-Waterloo Ctr. Grad. Work Chem., Univ. Guelph, Guelph, Ontario, Canada) **Analysis of an aromatic solvent used in a forest spray program.** *Chemosphere* 6(10): 641-651; 1977. (17 references)

This paper describes the detailed analysis of the aromatic solvent, Aerotox 3470, which is marketed as a high boiling aromatic distillate obtained as a by-product in refining crude oil. It has been estimated that between 1965 and 1969, about 10,000,000-20,000,000 gallons per year of aromatic solvents were introduced into the environment by pesticide spraying. The composition of this substance was found to be complex, consisting of isomeric alkylated naphthalenes, benzenes, bibenzyls, fluorenes and phenanthrenes, as well as the parent hydrocarbons with the exception of benzene and biphenyl. Clearly the indiscriminate spraying of large quantities of aromatic hydrocarbons can have a significant environmental impact. These chemicals can be bioaccumulated, and they are toxic to some species, having an impact on hepatic function. A correlation with Reye's syndrome has been questioned.

78-0208. Sattar, M. A. ; Hattula, M. L.; Lahtipera, M.; Paasivirta, J. (Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland) **Improved analysis method of MCPA from soil samples.** *Chemosphere* 6(11): 747-751; 1977. (15 references)

An improved method for the analysis of MCPA residues in soil was sought, using the reaction with pentafluorobenzyl bromide and developing the cleanup process. For each combination of soil type, extraction method and cleanup method, 48 gas chromatograms excluding standards and blanks were obtained. The recoveries of MCPA were calculated for each chromatogram and then averaged. The highest recoveries among 12 different treatment combinations of both soil types were obtained by extraction with shaking with ether-acetone- hexane-heptane (2:1:1:1) followed by derivatization and cleanup of the derivative by water-toluene shaking. The other cleanup methods and also combinations with extraction with ether-chloroform (1:1), pH 3, gave quite satisfactory recoveries as well. The latter extraction could be more generally applicable in cases of mixtures of acidic residues.

78-0209. Knepil, J. (Biochem. Dept. Western Infirmary, Glasgow, G11 6NT, Scotland) **A short simple method for the determination of paraquat in plasma.** *Clin. Chim. Acta* 79(2): 387-390; 1977. (9 references)

A method for the determination of paraquat in serum which can be performed in about 20 min is presented. Plasma proteins are first precipitated by the addition of a solvent/salt mixture, then the remaining paraquat is radicalized by the addition of alkaline sodium dithionite and measured by spectrophotometry. Absorbance is linear for initial paraquat concentrations in plasma between 0 and 5 mg/L, with a mean absorbance of 0.29 0.012 (C.V., 4.1%) at 396 nm for 2 mg/L, and will reliably allow detection of paraquat concentrations as low as 0.1 mg/L. The presence of diquat interferes with paraquat absorption, but can be approximately corrected for. This method may prove useful in assessing rates of paraquat absorption and removal in both clinical and experimental situations.

78-0210. Stadler, D. ; Ziebarth, U. (Dtsch. Hydrogr. Inst., 2 Hamburg 4, Germany) **Description of a method for the determination of dieldrin, *p,p'*-DDT and PCB's in seawater and data for the German Bight, 1974.** *Dtsch. Hydrog. Z.* 28(6): 263-273; 1975. (20 references) (German)

A monitoring cruise was undertaken in May 1974 aboard the survey and research vessel Gauss to monitor dieldrin, *p,p'*-DDT, and PCB levels in the German Bight. Ten liter water samples were taken from 20 sites and prepared for analysis on board and then taken to a land-based laboratory. The drying, concentrating, TLC, and GLC methods used to analyze the samples are described in detail. The mean values for dieldrin, *p,p'*-DDT, and PCB were 0.3, 0.3, and 3.1 ppt, respectively. The standard deviations were 30% for dieldrin, 40% for DDT, and 30% for PCB. The detection limit for the whole method is approximately 0.05 ng/kg for each individual substance.

78-0211. Braman, R. S. (Dept. Chem. Univ. S. Florida, Tampa, FL) **Applications of arsine evolution methods to environmental analyses.** *Environ. Health Perspect.* 91: 1-4; 1977. (17 references)

Techniques for the assay of environmental arsenic are presented. Arsine evolution by pH selective reduction permits specific analyses for inorganic arsenic III and V. Methyl arsenic acids can be analyzed by reduction to the corresponding arsines with sodium borohydride. The most sensitive and selective methods combine reduction, separation, and emission spectrophotometry, and can detect arsenic in samples in quantities as low as 2 ng.

78-0212. Stan, H.-J. (Inst. Lebensmittelchem., TU Berlin, D-1000 Berlin 12, Germany) **[Chemical ionization mass spec-**

trometry of organophosphorus pesticides with various reagent gases.] *Fresenius Z. Anal. Chem.* 287(2/3): 104-111; 1977. (6 references) (German)

Chemical ionization mass spectra (CI-MS) of 23 organophosphorus pesticides with isobutane as reagent gas were obtained by a combination of open tubular column gas chromatography-mass spectrometry. All substances show intense M + 1 ions in the CI-MS. The CI-MS of the individual substances obtained with isobutane were discussed and compared with their electron impact mass spectra (EI-MS) and CI-MS obtained with methane or methanol as reagent gases. The spectra became simpler applying CI-MS instead of EI-MS. In CI-MS the extent of fragmentation decreased changing the reagent gas from methane to isobutane and methanol. With methanol, usually only the M + 1 ion was observed in the spectra. For routine residue analysis, isobutane as reagent gas is recommended. (Author abstract by permission)

78-0213. Firestone, D. (Food Drug Admin. Bur. Foods, Dep. Health, Educ. Welfare, Washington, DC 20204) **Determination of polychlorodibenzo- *p*-dioxins and polychlorodibenzofurans in commercial gelatins by gas-liquid chromatography.** *J. Agric. Food Chem.* 25(6): 1274-1280; 1977. (20 references)

Residues of polychlorodibenzo-*p*-dioxins (dioxins) and polychlorodibenzofurans (furans) were found in commercial gelatin samples. The presence of dioxins and furans in the gelatin samples might have resulted from contamination of hides used as raw materials for gelatin manufacture by commercial pentachlorophenols (PCP), which may contain dioxins and furans. Fifteen-gram samples, after extraction and cleanup, were examined by electron-capture gas-liquid chromatography (EC-GLC). Recoveries of a number of dioxins and furans from fortified gelatin samples averaged 89 to 103%, with the exceptions of octachlorofuran (39%) and octachlorodioxin (70%). Fourteen of 15 commercial gelatins examined contained hexa-, hepta-, and octachlorodioxins at levels from 0.1 to 28 ppb of total dioxins. Levels of individual dioxins as low as 0.01 ppb were detected. Three bulk gelatins of Mexican manufacture contained from 24 to 28 ppb of total dioxins. Levels up to 0.4 ppb of heptachlorofuran and 0.4 ppb octachlorofuran were found in ten of the gelatins. Photodechlorination appeared to be useful for confirmation of octachlorodioxins in the samples. The presence of hexa-, hepta-, and octachlorodioxin and penta-, hexa-, and heptachlorofuran in one of the Mexican samples was confirmed with GLC-mass spectrometry. (Author abstract reprinted by permission of the American Chemical Society)

78-0214. Lawrence, J. F. ; Lewis, D.; McLeod, H. A. (Food Res. Div., Food Direct., Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario K1A OL2, Canada) **Confirmation of some NO_2-containing pesticides by chemical reduction and gas chromatography with electrolytic conductivity detection.** *J. Agric. Food Chem.* 25(6): 1359-1361; 1977. (4 references)

Confirmation of a number of NO_2-containing herbicides and fungicides has been carried out by reduction of the NO_2 group to - NH_2 with aqueous chromous chloride. The pesticide residue in 1 mL of benzene was shaken with 0.5 mL of the reagent for about 1 min at room temperature to effect complete conversion to the amino product. The aqueous phase was made basic and the products extracted with benzene for analysis. Analysis of the products by GLC with electrolytic conductivity detection (nitrogen mode) showed that most were about as sensitive as the parents. Generally, the derivatives eluted with retention times of 0.4-0.9 relative to the parent compounds on an SE-30/SP-2401 column. Applications of this method to the confirmation of trifluralin spiked in extracts of potato and dinoseb in peas were successful at levels of 0.5-1.0 ppm. (Author abstract reprinted by permission of the American Chemical Society)

78-0215. Lawrence, J. F. ; Leduc, R. (Food Res. Div., Food Direct. Health Prot. Branch, Tunney's Pasture, Ottawa, Ontario, K1A PL2, Canada) **Direct analysis of carbofuran and two nonconjugated metabolites in crops by high-pressure liquid chromatography with UV absorption detection.** *J. Agric. Food Chem.* 25(6): 1362-1365; 1977. (20 references)

Carbofuran and the nonconjugated forms of 3-hydroxycarbofuran and 3-ketocarbofuran were extracted from several spiked foods by blending with acetone. The extract was partitioned into hexane-methylene chloride and passed through a 2% deactivated Florisil column for cleanup. The pesticide fractions were evaporated to near dryness and dissolved in 2,2,4-trimethylpentane (TMP, isooctane) for high-pressure liquid chromatographic (HPLC) analysis on a 25 cm x 2.2 mm (i.d.) LiChrosorb Si 60 (5μm) column. Mobile phase composition varied between 3-8% (v/v) 2-propanol in TMP depending upon the compound and food analyzed. Detection was carried out at 254 nm for 3-ketocarbofuran while 280 nm was used for carbofuran and 3-hydroxycarbofuran. Detection limits in the foods studied were about 0.05 ppm for carbofuran and 3-hydrocarbofuran and 0.02 ppm for 3-ketocarbofuran. Recoveries ranged from 68-110% for the foods and compounds studied at 0.1 and 1.0 ppm. (Author abstract reprinted by permission of the American Chemical Society)

78-0216. Gaeb, S. ; Born, L.; Parlar, H.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH Muenchen, D-8051 Attaching, Germany) **Structural elucidation of an octachloro component of technical chlordane (compound K) by spectroscopic and X-ray methods.** *J. Agric. Food Chem.* 25(6): 1365-1371; 1977. (14 references)

The technical chlordane constituent designated compound K is a formal isomer of chlordane ($C_{10}H_6Cl_8$) which is formed by chlorination of α-chlordene (1) ($C_{10}H_5Cl_5$) via a Wagner-Meerwein rearrangement. Structural elucidation of K involves dechlorination reactions, especially spectroscopic studies (MS, ^1H NMR, and ^{13}C NMR) of various photodechlorination products (3-7). From these data a structure for compound K is proposed. Confirmation of this structure is

obtained by single-crystal x-ray diffraction. According to the results, compound K corresponds to 2,4,4,5,6,6,7,8-octachlorooctahydro -1,5- ethenopentalene (2). (Author abstract reprinted by permission of the American Chemical Society)

78-0217. Ross, R. D. ; Morrison, J.; Rounbehler, D. P.; Fan, S.; Fine, D. H. (Thermo Electron Res. Cent., Waltham, MA 02154) **N-nitroso compound impurities in herbicide formulations.** *J. Agric. Food Chem.* 25(6): 1416-1418; 1977. (10 references)

Determination of gas chromatograph amenable nitrosoamines in several herbicide formulations revealed levels of *N*-nitrosodipropylamine from 0 to 640 ppm and 0 to 195 ppm, respectively. A Thermal Energy Analyzer was employed for detection after separation by gas chromatography or high-performance liquid chromatography. With additional chromatographic cleanup the identity of the compounds was confirmed by high-resolution mass spectrometry. These results indicate that formulations of amine salts can form nitrosamines on storage, and nitrosoamines can be formed in preparations of nitroaniline based herbicides. (Author abstract reprinted by permission of the American Chemical Society)

78-0218. Aten, C. F. ; Bourke, J. B. (Dep. Chem. Hobart and William Smith Coll., Geneva, NY 14456) **Reverse-phase liquid chromatographic behavior of some carbamate and urea pesticides.** *J. Agric. Food Chem.* 25(6): 1428-1430; 1977. (6 references)

Sensitivities (absorbance at 254 nm) and retention volumes with carriers of various polarities are reported for a group of carbamates and substituted ureas on a nonpolar column. Sensitivities varied widely (0.01 to 1 absorbance unit/μg) depending on the compound and the retention volume. The ureas had the larrgest sensitivities. The retention volumes were near 3.5 mL for most of the samples with methanol as carrier. However, either increasing or decreasing the polarity of the carrier usually increased the retention volumes. The signals were all sharp in the most polar carriers but tailing was serious for five cases in the carriers less polar than methanol. (Author abstract reprinted by permission of the American Chemical Society)

78-0219. van Dijk, A. ; Ebberink, R.; de Groot, G. (Univ. Toxicol. Cen., Lab. Analyt. Toxicol., Utrecht, The Netherlands) **A rapid and sensitive assay for the determination of paraquat in plasma by gas-liquid chromatography.** *J. Anal. Toxicol.* 1(4): 151-154; 1977. (6 references)

A method for the determination of paraquat in plasma is presented which involves protein precipitation with trichloroacetic acid, reduction of the paraquat, extraction with ether, and analysis by gas chromatography. Ethyl viologen is used as an internal standard, and reproducibility is excellent. Levels of paraquat as low as 0.030 mg/L in the serum can be detected with this assay.

78-0220. Lea, R. (Country Pride Foods, El Dorado, AR 71730) **Separation of pesticide residues from lipids prior to gas-liquid chromatographic analysis.** *J. Assoc, Off. Anal. Chem.* 59(1): 224-225; 1976. (9 references)

Lipids are separated from dieldrin, endrin, and *p,p*'-DDE residues by saponification in ethanolic sodium hydroxide, acidification with dilute sulfuric acid, and adsorption chromatography on deactivated alumina, using petroleum ether as the eluant. Dieldrin, endrin, and *p,p'*-DDE are efficiently recovered (95-102%), and *p,p'*-DDT is converted to *p,p'*-DDE, which is then recovered with high yield (90-96%). Extremely low lipid carryover ($<$ 0.3-0.5%) is observed for 0.5-1.0 g samples of chicken fat. (Author abstract by permission)

78-0221. Osadchuk, M. ; Salahub, E.; Robinson, P. (Health Welfare Can., Health Prot. Br., Scarborough, Ontario, Canada M1P 4R7) **Isolation of chlorophenoxy herbicides on columns of glass beads.** *J. Assoc. Off. Anal. Chem.* 60(6): 1324-1327; 1977. (4 references)

A method for the analysis of chlorophenoxy herbicide residues has been developed based on the observed adsorptive affinity of chlorophenoxy acids for glass surfaces. Extracted residues of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) herbicides are adsorbed onto a column of fine mesh glass beads, and subsequently esterified with diazomethane for gas-liquid chromatographic quantitation, using an electron capture detector. Prior to injection, the esterified sample is cleaned up by passing through a Florisil column. The method is sensitive to about 0.05 ppm 2,4-D and 0.01 ppm 2,4,5-T. Recoveries averaged from 31 to 101%, depending on the level added and the substrate. (Author abstract by permission)

78-0222. Francoeur, Y.; Mallet, V. (Univ. de Moncton, Dep. Chem., Moncton, New Brunswick, Canada E1A 3E9) **Simultaneous determination of captan and captafol in apples and potatoes by thin layer chromatography and in situ fluorometry.** *J. Assoc. Off. Anal. Chem.* 60(6): 1328-1330; 1977. (5 references)

A simple method is described for the simultaneous quantitative determination of captan [*N*-(trichloromethylthio)- 3a,4,7,7a-tetrahydrophthalimide] and captafol [*N*-(1,1,2,-2-tetrachloroethylthio) - 3a,4,7,7a - tetrahydrophthalimide] in apples and potatoes. The fungicide residues are extracted with acetonitrile, partitioned into a solution of methylene chloride in petroleum ether, separated from each other and the co-extractives on a thin layer chromatographic plate impregnated with aluminum chloride, sprayed with sodium chlorate, and heated. The fluorescence is then measured directly from the chromatogram. Recoveries were greater than 90% in the test crops at the 0.2 ppm level. (Author abstract by permission)

78-0223. Wells, D. E. ; Johnstone, S. J. (Freshwater Fisheries Lab., Pitlochry, England) **Method for the separation of**

organochlorine residues before gas-liquid chromatographic analysis. *J. Chromatogr.* 140(1): 17-28; 1977. (7 references)

The adsorption characteristics of alumina and silica for column chromatography have been assessed to develop a method, using a single solvent, for the separation of seventeen organochlorine residues into four eluates prior to gas-liquid chromatographic analysis. The effects on the adsorbents of thermal activation and subsequent deactivation with water, variation of column size and choice of eluents have been critically examined. The lipid capacity of the alumina and the effect of co-extracted materials from animal tissue upon the elution profile of the organochlorines have been determined. (Author abstract by permission)

78-0224. Chapman, R. A. ; Robinson, J. R. (Agric. Can. Res. Inst., Univ. Sub Post Office, London, Ontario, N6A 5B7 Canada) **Simplified method for the determination of residues of carbofuran and its metabolites in crops using gas-liquid chromatography-mass fragmentography.** *J. Chromatogr.* 140(3): 209-218; 1977. (24 references)

The gas-liquid chromatographic behavior of 2,3-dihydro -2,2- dimethyl -7- benzofuranyl methylcarbamate (carbofuran), its 3-keto-, and 3-hydroxy-derivatives, their respective phenolic hydrolysis products and the heptafluorobutyryl (HFB) derivatives of the carbamates and phenols were studied by examining the column effluent using chemical ionization mass spectrometry. In contrast to the behavior of the carbamates, their HFB derivatives consistently produced ions having intensities proportional to the quantities injected. The common base-peak ion at 228 a.m.u. was used to quantitate these materials at the 0.02-1 ppm level in field-treated carrots, celery, tomatoes and corn with minimal sample preparation. (Author abstract by permission)

78-0225. Matisova, E. ; Krupcik, J. (Chem. Fac. Dep. Anal. Chem., Slovak Tech. Univ, 880 37 Bratislava, Czechoslovakia) **Capillary gas chromatography of *s*-triazines.** *J. Chromatogr.* 142: 597-609; 1977. (10 references)

In order to achieve better resolution and lower detection limits for *s*-triazines, glass capillary columns made of soft soda-lime glass and etched with gaseous hydrogen chloride have been introduced. Columns with non-polar (OV-101, SE-30) mixed (Carbowax 20M + SE-30) and polar stationary liquids (Carbowax 20M) were used. The thickness of the ultra-thin film columns was determined by weighing the capillaries before and after coating of the capillary with stationary phase and conditioning, and varied from 0.05 to 0.5 μm. From the capacity ratios of *s*-triazines and *n*-alkanes measured in sections of an originally long dynamically coated column after it had been cut into several equal parts, the constancy of the film thickness along the whole column was judged. The film thickness was not uniform and increased along the whole column. It was found that glass capillary columns with non-polar stationary phase are not very suitable for the analysis of *s*-triazine herbicides, as tailing occurs with some of them. Symmetrical peaks and the separation of 17 from 18 analyzed *s*-triazines were achieved on glass capillary columns coated with Carbowax 20M. (Author abstract by permission)

78-0226. Jork, H. ; Roth, B. (Univ. Saarlandes, Fachbereich 15, Anal. Biol. Chem., 66 Saarbruecken 11, Germany) **[Comparative chromatographic analyses of *s*-triazines.]** *J. Chromatogr.* 144(1): 39-56; 1977. (37 references) (German)

The applicabilities of gas chromatography (GC), high-performance liquid chromatography (HPLC), thin-layer chromatography (TLC) and high-performance thin-layer chromatography (HPTLC) for residue analysis of *s*-triazine herbicides are compared. With the conditions discussed the detection limit for the 14 *s*-triazines was determined as follows: 0.02-0.03 ng in GC alkali flame-ionization detection, 0.8 ng in GC flame-ionization detection, 1 ng in HPLC (UV detection), 3-5 ng in HPTLC (UV detection) and 8-13 ng in TLC (UV detection). The linear range in GC (A-FID) was 10^4 whereas in the three liquid chromatographic methods it was 10^2. The reproducibility with a confidence limit of $P = 95\%$ had a coefficient of variation of 5%. In routine analysis requiring a large number of separations HPTLC has advantages, because the time for a single separation is only 40 sec. (Author abstract by permission)

78-0227. Nagasawa, K. ; Uchiyama, H.; Ogamo, A.; Shinozuka, T. (Sch. Pharm. Sci., Kitasato Univ., Minato-ku, Tokyo 108, Japan) **Gas chromatographic determination of microamounts of carbaryl and 1-naphthol in natural water as sources of water supplies.** *J. Chromatogr.* 144(1): 77-84; 1977. (12 references)

A method for the clean-up and quantitative determination of Carbaryl and its hydrolysis product, 1-naphthol, in natural waters is described. After extraction of a water sample with methylene chloride, the two compounds were separated from possible organochlorine pollutants such as Endrin, γ-BHC, *p,p'*-DDT, pentachlorophenol and polychlorinated biphenyl, and their heptafluorobutyryl derivatives obtained. Determination by electron-capture gas chromatography at the 2.5-10 ppb level, using 11 of water samples, was carried out. (Author abstract by permission)

78-0228. Bradway, D. E. ; Shafik, T. (Dept. Epidemiol. Public Health, Univ. Miami, Miami, FL) **Electron gas capture chromatographic analysis of the amine metabolites of pesticides: derivatization of anilines.** *J. Chromatogr. Sci.* 15: 322-328; 1977. (14 references)

The development of a methodology for the analysis of amine metabolites of pesticides in urine is presented. The pesticides studied were propanil, propham, carbetamide, chlorpropham, barban, fenuron, siduron, monuron, monolinuron, urox, metabromuron, diuron, neburon, linuron, chlorotoluron. The results of a survey involving derivatization of these compounds is also presented. Gas chromatographic analysis of pesticide derivatives (anilines) from spiked water and urine samples at 1.0 and 0.1 ppm levels resulted in recoveries between 85 and 90%. Chromatographs

were clean and easily quantitated. The method presented in this paper is a valuable tool in monitoring environmental exposure to those classes of pesticides which produce aniline urinary metabolites: it is rapid and readily applicable to analysis of large numbers of samples such as would be encountered in a monitoring or clinical laboratory.

78-0229. Greenhalgh, R. ; Wood, G. W.; Pearce, P. A. (Chem. Biol. Res. Inst. Agric. Canada, Ottawa, Ontario, K1A OC6, Canada) **A rapid GC method of monitoring mesurol [4-(methylthio)- 3,5-xylyl-*N*- methyl carbamate] and its sulfoxide and sulfone metabolites in lowbush blueberries.** *J. Environ. Sci. Health* B12(4): 229-244; 1977. (10 references)

A new method for the determination of mesurol, and its oxidation products in blueberries is presented. This technique involves blending the blueberries in acetone, partitioning with chloroform, derivatization with trifluoroacetic anhydride, and analysis using a gas chromatograph with flame photometer. Recoveries of mesurol and mesurol sulfoxide at the 1 ppm level, and mesurol sulfone at the 0.3 ppm level were obtained with a 25 g sample of field treated blueberries. The sensitivity of this method may be increased 5x by inclusion of a clean-up step. Optimal conditions for detection of merusol using a modified Bendix sulfur/phosphorus emission detector operating in the sulfur mode were an oxygen/hydrogen ratio of 0.38 and a column flow of 60 ml/min.

78-0230. Maruyama, T. ; Ushigusa, T.; Kanematsu, H.; Niiya, I.; Imamura, M. (Japan Inst. Oils Fats Other Foods Inspect. Fdn., Chuo-ku, Tokyo, Japan) **[A method for determination of phthalate esters in food by improved essential oil distillator.]** *Shokuhin Eiseigaku Zasshi (J. Food. Hyg. Soc. Jpn.)* 18(3): 244-251; 1977. (6 references) (Japanese)

An improved method for the determination of phthalate esters in food using an essential oil distiller is presented. A series of trials was performed with 2 g organic samples contaminated with organochlorine pesticides and HCB. Ninety-nine percent of these compounds, which produce interfering peaks on the GLC, were removed by mixing the sample with zinc powder, refluxing, and using the Florisil batch method. A known quantity of pyrene was added in the final pretreatment step and compared with an internal standard to increase the precision of the determination. Blank values were decreased because the number of reagents and apparatus used was small.

78-0231. Yamato, Y. ; Suzuki, M.; Watanabe, T. (Kitakyushu Munic. Inst. Environ. Health Sci., Tobata-ku, Kitakyushu, Japan) **Data processing of sulfur containing organophosphorus insecticides using gas chromatograph.** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jpn.)* 18(3): 273-277; 1977. (9 references)

A study was made of the analysis of sulfur containing organophosphorus insecticides by gas chromatography with a dual channel flame photometric detector and data processing using a digital integrator. Using the P mode, the calibration curves of all insecticides employed showed a linear range from zero to hundreds or thousands of nanograms. In the S mode, also, similar results were obtained. However, these indicated linearity on only a log-log scale. Using the dual channel flame photometric detector gas chromatograph with attached digital integrator, simultaneous identifications of insecticides containing sulfur and phosphorus in the molecule could be done. On Apolar 10C, resolution of malathion, salithion, fenitrothion, ethion, methyl trithion, and EPN was achieved. Ronnel, fenitrothion, ethion, and EPN were separated on QF-1. Because of these results Apolar 10C was used for organophosphorus insecticide analysis. Many interfering peaks were shown at the shorter retention times on the gas chromatograms of vegetable extracts in the S mode. However, few interfering peaks were noted in the P mode.

See also **78-0006** **78-0122** **78-0136** **78-0147** **78-0164**

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